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First Biennial Report

# of the

Montana State Board of Health

From its Creation

March 15th, 1901 to

November 30, 1902

A. F. LONGEWAY, C. M., M. D., Secretary

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Members of the Board.

Gov. Joseph K. Toole, Ex-officio.
Hon. James Donovan, Atty. Gen., Ex-officio.
Wm. Treacy, M. D., Helena, President.
James Belcher, M. D., Townsend.
Hugo J. Loebinger, M. D., Resigned.
James M. Robertson, C. E., Bozeman.
A. F. Longeway, C. M., M. D., Sec., Great Falls, Mont.

To His Excellency,
JOSEPH K. TOOLE,
Governor of Montana:

Sir:—In accordance with statutory requirement I have the honor to herewith present you the First Biennial Report of the Montana State Board of Health.

I am very respectfully,
A. F. LONGEWAY, Sec.

Report of Board of Health.

To the Hon. J. K. Toole, Governor of Montana:

Sir:—In compliance with the laws of the State I present to you the accompanying report for the fiscal year ending November, 30th, 1901.

Very respectfully,
A. F. LONGEWAY,
Secretary of the State Board of Health.

The Seventh Legislative Assembly of the State of Montana during its session in the winter of 1901 passed House Bill No. 104 which became a law upon the receipt of the signature of the Governor, March 15, 1901, and which created a State Board of Health of Montana, defining its powers and the duties of its officers.

Prescribing the general line of work of the office which is to be the general care of the sanitary interests of the people of this State, making inquiries and the investigation of diseases and their causes, and are empowered to adopt all needful rules and regulations, subject to the provisions of this Act, for the suppression of nuisances and the spread of disease. They are also to inquire into the causes of epidemics and mortality and the influence of locality, climate, employments and habits and other circumstances and conditions influencing the health of the people.

They shall inquire into and investigate all nuisances affecting the public health in any part of the State, and are empowered to suppress and abate the same.

Every County in this State has a local or County Board of Health under the provisions of this Act, and every town, village or city incorporated or otherwise throughout the State should have organized local Boards of Health to cope with the needs of the immediate vicinity. These various Boards are all subservient and should report very promptly to the State Board of Health.

The State Board consists of J. K. Toole, Governor, Ex-officio; Jas. Donovan, Att'y. Gen., Ex-officio; Wm. Treacy, M. D., President; J. L. Belcher, M. D.; J. M. Robertson, C. E.; A. F. Longeway, Secretary and Executive Officer of the Board.

One vacancy on the Board by resignation.

The first meeting was held on April 1st, and effected a permanent organization by electing Wm. Treacy, M. D., President, and A. F. Longeway, Secretary.

Instructions were issued to the secretary to print rules and regulations governing the local Boards of Health and aid in their organizations.

The next meeting was held in the Governor's office, May 9th, Present, Gov. Toole, Att'y. General Donovan, Dr. Belcher and A. F. Longeway, Secretary.

The rules recommended by the National Funeral Directors Ass'n. for the transportation of the remains of persons dead of contagious diseases were adopted, and all undertakers wishing to ship such bodies were to appear before the Board and pass the required examination, showing their fitness to prepare such bodies for shipment, the medical men on the Board to be the examiners. Notice was to be given all undertakers to that effect.

The Board's attention was directed to the so-called "Spotted Fever" in the Bitter Root Valley.

Five hundred copies in pamphlet form of the health laws of the State were ordered printed, also one thousand copies of pamphlet pertaining to infectious diseases and such other printing as the Secretary might require to carry on the work of the State Board of Health.

A resolution was adopted that all school children should be vaccinated, before attending the public, private or parochial school.

The next regular meeting was held in the Governor's office on May 22nd. There were present, Governor Toole, Att'y. Gen. Donovan, Dr. Treacy, Dr. Belcher and A. F. Longeway, M. D.

Mr. Emil Starz was appointed State Bacteriologist and the Secretary was instructed to get the necessary equipment to carry on the work of that branch of the Board.

Thirty undertakers were examined and the licenses issued.

The next regular meeting was held in the Governor's office on November 5th. Those present were, Gov. Toole, Att'y. Gen. Donovan, J. M. Robertson, Dr. Belcher and A. F. Longeway, M. D.

Mr. Robertson was instructed to examine and report on the complaint of the sanitary condition of the reservoir at Elkhorn.

The Governor appointed Donovan and Longeway as Finance Committee to audit and pass on all bills.

Four undertakers presented themselves for examination three of whom passed and were granted licenses.

Much of the work of the Secretary's office has been devoted to the organization of the County Boards of Health and the compilation of trustworthy information, which may be helpful to the Local Boards of Health to be distributed to the public with an outline of the necessary precautions for the prevention, avoidance and care of dangerous diseases as well as instructions and facts regarding vaccinations, getting out blank reports, and notification cards of infectious diseases to be sent immediately upon information of the existence of such disease.

All blanks are printed under the style of "form" and all information upon any special subject are printed under style "Circular." Circular No. 1 containing the laws to public health and Circular No. 2 distributed information upon diseases dangerous to the public health etc., besides these many circular letters upon topics of passing importance are issued from the office for the purpose of obtaining necessary information upon some particular point or distributing information upon matters already obtained.

This office having compiled and completed a correct list of all practitioners of medicine within the State as well as the school trustees and clerks of the school board also the members of the local Boards of Health. These comprise the mailing lists within the State.

Aside from these we keep up an extensive correspondence with the Boards of Health of other States regarding the work done by them and the results obtained.

Since the organization of this Board I can see a great improvement in the uniformity of the sanitary work throughout the State. Though I regret that the County Commissioners are prone to be inclined to farm out the Board of Health work by asking for competitive bids, oftentimes combining it with the care of the county poor, etc., without regard to a man's qualifications for such work. The too frequent loss from the public health service of a conscientious local officer who has carefully informed himself regarding the duties of the office and has done them well.

The value of such a man's services is so great that a town or county should retain such a man at any reasonable cost, where it is evident that the right one for the place has been found. Frequently it would seem that appointments were made on local Boards of Health for other reasons than that they are men who are best fitted to serve the interests of the town or county from both the financial and public health point of view. The best men in the locality are none too good to look after the interests of the life, health and to do it economically, and it is more likely to be done economically when it is done promptly and efficiently.

During the past six months there has been no epidemic except smallpox that has required any special effort.

The coming year I should strongly urge the State Board to hold a convention in some central place for the interchange of ideas and the education of the local health officers. I believe this could be done under the auspices of the State Board of Health by inviting some of the best men from the adjoining States to deliver lectures or addresses upon chosen topics of interest. This form of convention has proven of great value in other states. The State should also send delegates to the convention held in the interests of the public health in the East, much valuable information is obtained in that way, and greatly exceeding the cost incurred.

The total number of contagious diseases dangerous to the public health, reported to this office to October, 1st 1901, covering a period of six months have been as follows:

Smallpox	448 cases.
Scarlet Fever	37 cases.
Diptheria	64 cases.

Including several counties from which we have not received any annual report.

Measles have not been reported in individual cases excepting from two counties, Carbon, two cases, and Jefferson one case, while in Cascade we had an epidemic and in Stockett and Belt, amounting to about 100 cases.

This department has endeavored to inquire into the cause of so-called "Spotted Fever" occurring in Deer Lodge county, but owing to the lateness of the season before we organized to make inquiry little work has been done as yet, but expect to take up the matter again in the early Spring. The work of the office is gradually becoming pretty well organized. I think the Local

Boards throughout the State are making an earnest effort to carry on the work in systematic and thorough manner, and I feel sure within another year the organization will be so far advanced as to enable us to carry on the work in a competent way.

The effort made throughout the State to stamp out the epidemic of smallpox has been strenuous and meeting with favor and good results.

The initial meeting of the State Board of Health of Montana was called to order in Helena, at 3 P. M., April 1st, 1901, in the Governor's office. The following members were in attendance: Hon. J. K. Toole, Governor, Ex-Officio; James Donovan, Attorney General, Ex-Officio; Dr. Wm. Treacy, all of Helena. Dr. James L. Belcher, Townsend; H. J. Loebinger, Butte; J. M. Robertson, Civil Engineer, Bozeman; Chairman Pro Tem, Hon. J. K. Toole. Secretary Pro Tem, H. J. Loebinger, M. D.

The State Board was then formally organized, and the Chairman read the new law governing the Board of Health, and they next proceeded to elect permanent officers with the following result:

President, Dr. Wm. Treacy; Secretary, Dr. A. F. Longeway, who was nominated by Attorney General Donovan.

Thereupon the President took his chair and the Secretary pro tem was directed to notify Dr. Longeway of his election.

The duties of the Secretary were next defined, to-wit: He is requested to elaborate rules and regulations referring to the management of local Boards of Health, which must hereafter be instituted in each County to aid in the formation of such Boards, and to forward the rules and regulations to each County. These regulations must conform with the laws governing the State Board of .Health. The individual counties are obliged to inform the State Board of Health's Secretary that they have complied with the law.

We to have the new law printed, and all printing to be done by the State printing office, and to forward copies of the same to each county and Health official, also to each member of the State Board of Health.

He is to co-operate with all local Boards in enforcing the law. He is to have a set form of questions printed on blanks, these questions pertaining to infectious and contagious diseases, mentioned in the law, paying particular attention to tuberculosis, which disease is not mentioned among infectious diseases in the law, but which is to be added thereto.

These information blanks are to be forwarded to the Health Official in each county, must be properly and correctly answered, and returned to the Secretary of the State Board of Health, and used by him for statistic purposes.

All business having thus been transacted the Board adjourned subject to a call for special meeting by the President, which is to take place before the next regular meeting.

Respectfully submitted,
DR. H. J. LOEBINGER,
Secretary, Pro Tem.

In pursuance to a call by the Secretary, the State Board of Health convened in the office of the Governor in Helena, May 9th, at 2 P. M.

Present, Hon. J. K. Toole, Governor, Ex-Officio; James Donovan, Atty. Gen., Ex-Officio; Dr. J. L. Belcher, A. F. Longeway, Secretary. In the absence of the permanent president, Dr. Treacy, Dr. Belcher was called to the chair.

The minutes of the previous meeting were read and approved, and ordered transcribed in the minutes book as part of the record.

The communication from Dr. Bracken and Mr. Smart regarding the adoption of rules recommended by the National Funeral Directors Association and the American General Baggage Association for the transportation of corpses, who have died of contagious diseases, and licensing embalmers were read and discussed at length, and finally adopted.

Rule 10 was ordered changed and made to conform with the laws of the State.

An examining Board to inquire into the qualifications of embalmers, and to issue a license to same in conformity with the laws now adopted by Minnesota and other states, was ordered to consist of medical men of the Board, being Drs. Wm. Treacy, Hugo Loebinger, J. L. Belcher and A. F. Longeway. They were to hold the examinations once or twice yearly in the city of Helena, at such time and place as they may determine upon, and give notice to all embalmers who wish to ship bodies without the State, to appear before such Board for examination and license.

Communications regarding the prevalence of so-called "Spotted Fever" in the Bitter Root Valley, were discussed and the evidence at hand not being sufficient to authorize any definite action, the Secretary was instructed to obtain reports and all possible information from the local Boards in the counties in which there had been such disease, and report at the next regular meeting, or if deemed advisable, upon the information so obtained, to call a special meeting at any time to consider the matter.

Action to obtain reports from local health officers of these localities to be taken immediately.

Copies of rules and regulations pertaining to contagious and infectious diseases, and quarantine of same were presented by the Secretary, and after examination by a committee, were approved.

An order was made to request the secretary of the State to furnish the Board with 500 copies in pamphlet of the Health Laws of Montana, also 1000 copies of rules and regulations as were recommended by the secretary and adopted, and a sufficient supply of other blanks as might be required to carry on the work of the Board.

Blanks were also ordered as required by the Board to examine and license embalmers.

Moved, seconded and carried that the former order was to cover all printing required by the Secretary.

In consideration of the general prevalence of smallpox throughout the State it was deemed advisable to notify all school boards, and to require all school children to be vaccinated or show evidence of successful vaccination within the past five years, before attending any public, private or parochial school.

Upon motion the regular meeting shall be held upon the first Tuesday of August of each year and quarterly thereafter.

Motion to adjourn prevailed.

A. F. LONGEWAY,
Secretary.

Pursuant to a regular call the State Board of Health met in Helena, in the Governor's office at 3 P. M., Aug. 22nd, 1901.

Those present were, J. K. Toole, Governor; James Donovan, Atty. Gen.; Dr. Wm. Treacy, President; Dr. J. L. Belcher; and A. F. Longeway, Secretary.

After the reading of the minutes of the previous meeting considerable discussion was elicited regarding the order that school children be vaccinated and it was concluded to let the minutes stand as read.

A bill of Twenty-five Dollars ($25.00) was presented by Emil Starz for bacteriological investigation for so-called "Spotted Fever" and allowed.

The appointment of State Bacteriologist for the investigation of diphtheria was discussed, and it was determined to appoint Mr. Emil Starz as State Bacteriologist upon terms presented by him to the Secretary, and it was authorized that the State Board of Health should invest in the necessary paraphernalia mentioned in such proposition for the carrying on of said work.

The examination for undertakers was discussed and the monies collected from applicants for licenses were ordered turned into the State Treasury to be placed to the credit of the State Board of Health. Such monies amounting to one hundred and fifty dollars.

It was determined by the Board that twenty-five dollars per month, payable monthly, should be allowed the Secretary for typewriting and clerk hire, beginning August 1st, 1901.

The secretary was authorized to purchase at his convenience the necessary equipment for transmitting bacteriological specimens in way of shipping tubes, and to establish depositories at convenient points throughout the State for the convenience of practising physicians, in collecting samples from suspected sore throats, etc., to be transmitted to the State Bacteriologist as necessary.

As a result of the examination of undertakers thirty passed the examination and were entitled to certificates.

No further business being before the Board they adjourned to meet at the next regular meeting in November.

A. F. LONGEWAY,
Secretary.

The regular meeting of the State Board of Health was held in Helena, November 5th, 1901, at 2 P. M.

Those present were, J. K. Toole, Governor; James Donovan, Atty. Gen.; Mr. Robertson, C. E.; Dr. J. L. Belcher, and A. F. Longeway, Secretary.

The minutes of the previous meeting were read and approved. A short report from the Secretary was read and approved.

It was resolved that the Board hold an examination for undertakers and embalmers, there being four present in the city to take the examination.

A petition from the residents of Elkhorn requesting that a certain reservoir used for the purpose of supplying water, be looked into and the condition reported upon.

It was moved by Attorney General Donovan that Mr. Robertson, C. E., be sent to Elkhorn to inspect the condition of the reservoir, taking samples of the water to be sent to the State Bacteriologist, Emil Starz, for examination, and to use what influence we could without process of law to induce the owners to place the reservoir in a thoroughly sanitary condition.

The Governor suggested there should be a finance committee appointed by the Board and proceeded to appoint James Donovan, Attorney General, and A. F. Longeway, Secretary, as such committee to audit and pass upon all bills.

The Board then adjourned to hold the examination of undertakers at 4 o'clock at Mr. Flaherty's undertaking parlors. Those presenting themselves for examination were, Mr. Knight, Butte; Edward Polley, Butte; Warrington Richards, Butte; Guy Ralph Lowe, Glendive.

Three of the above applicants passed the examination successfully and were granted licenses. There being no further business before the Board they adjourned to meet at the next regular meeting to be held in February, 1902.

A. F. LONGEWAY,
Secretary.

The regular quarterly meeting of the State Board of Health was held in the afternoon of February 4th, 1902, in the Governor's office in Helena with the following named officers present:

Hon. James Donovan, Attorney General; Dr. Wm. Treacy, President; Dr. J. L. Belcher and A. F. Longeway, Secretary.

In the forenoon preceding the meeting the examination for undertakers and embalmers was held with the following named applicants: William Knight, Butte; Minas D. Giffin, Butte; Michael J. Walsh, Anaconda; E. L. Conrad, Anaconda; Oro Willoughby, Kalispell; Nelson Willoughby, Kalispell. All of whom passed successfully and were granted licenses.

The question of holding a convention of all the health officers in the State for the interchange of ideas, was discussed and favored. It was suggested that we secure some competent Eastern sanitarians to address the meeting but no definite plans nor time was appointed for such meeting, but it will be taken up at the next meeting and decided upon.

The question of continuing the investigation of the "Spotted Fever" in the Bitter Root Valley was discussed, and it was unanimously agreed upon that the investigation should be pursued to the best of our ability as soon as the occasion arose.

The bills were discussed and passed and the Secretary was instructed to purchase the necessary files and register for his office at his convenience.

There being no further business before the Board they adjourned to meet at the next regular meeting to be held in May.

A. F. LONGEWAY,
Secretary.

The regular meeting of the State Board of Health was held in Secretary's office in the Capitol building at 3 P. M., Aug. 5th, 1902.

There were present, J. K. Toole, Governor; James Donovan, Attorney General; Dr. Wm. Treacy, President; Dr. Belcher, and A. F. Longeway, Secretary.

After the reading of the minutes of the previous meeting which were approved, considerable discussion took place regarding the investigation of "Spotted Fever" in the Bitter Root Valley, and the authority for doing the same.

It was moved by the Governor and seconded by the Attorney General that the bills for the investigation be allowed. Dr. L. B. Wilson's bill, which was for $1,037.60, and Dr. Crowning's bill for $428.40, were those allowed at this meeting.

In consideration of the fact that the fund at the disposal of the Board was nearly exhausted, it was concluded we should spend no more money this year in the investigation, but the secretary was instructed to take up the matter with the County Commissioners of Ravalli and Missoula Counties, and endeavor to have them appropriate a sufficient sum to carry on the work to its completion.

Report upon examination for undertakers for licenses which was held in Great Falls July 25th, 1902, at the time of the annual meeting of the Undertakers' Association, when Jacob Opp, Helena; Nellie McAllister, Great Falls; Frank Lemmer, Havre; Chas. Walter Todd, Great Falls; Chas. E. Richards, Lewistown, presented themselves for examination and were granted certificates. The Board at their regular meeting confirming same.

The resignation of Emil Starz, State Bacteriologist, was read and the Board saw fit to refuse to accept the resignation at that time.

The Secretary presented the following report of infectious and contagious diseases, from February 4th, 1902, to Aug. 1st, 1902.

Smallpox	490 cases.
Measles	124 cases.
Scarlet Fever	213 cases.
Chickenpox	1 case.
Diphtheria	26 cases.
Whooping Cough	7 cases.
Typhoid Fever	7 cases.

There being no further business before the Board they adjourned to meet at the next regular meeting to be held the first Tuesday in November.

A. F. LONGEWAY,
Secretary.

Pursuant to call the regular quarterly meeting of the State Board of Health was held in the Secretary's office in the Capitol building in Helena, November 5th, 1902, at 3 P. M.

The following members responded to roll call: J. K. Toole, Governor; James Donovan, Attorney General; Dr. Wm. Treacy, Dr. J. L. Belcher, and A. F. Longeway, Secretary.

The minutes of the previous meeting were read and approved. Considerable discussion for the printing of the first biennial report of the Board took place, and it was determined that the same should be printed and distributed according to the provisions of the Act creating said Board. It was determined that probably five hundred copies would be necessary.

The publication of the report on the investigation of the "Spotted Fever" was carefully considered, and upon showing that the necessary drawings and lithographic work to demonstrate the bacteriological findings would amount to more money than the Board could well afford at this time, therefore it was considered wise for the Secretary to correspond with bacteriologists and see if he could not get some journal of progressive medicine to publish the article in its original form and then endeavor to buy the necessary plates for our annual report of them, providing the cost was within our means.

The miscellaneous bills accrued from investigation were allowed.

It was considered very important that the copy of the annual report should be in the hands of the printer as soon after the closing of the fiscal year, Dec. 1st, as possible, that we might be able to have it in the hands of the Legislature in the early part of the session.

There being no further business before the Board it adjourned until the next regular meeting.

A. F. LONGEWAY,
Secretary.

There have been shipped during the year 1902 the following number of dead bodies over the different roads:

Great Northern, 62; Northern Pacific, 3; Oregon Short Line, 23; Montana Central Ry., 5.

Tuberculosis.

Following out the suggestions at the meeting of organization of the Board of Health that the Secretary pay special attention to the prevalence of tuberculosis existing in the State, the following letter was prepared:

STATE BOARD OF HEALTH
OF MONTANA.

May, 1902.

Dr.................................

Dear Doctor:

This office is very desirous of acquiring trustworthy information regarding the prevalence of tuberculosis in this State, and inasmuch as there have been no reports of such cases in the past, we have only to rely upon the profession for such data as they alone are able to furnish.

The care and prevention of this dread disease is even more at heart with the people than any other malady that affects the general public. We realize that the data collected may be incomplete, but we trust that every practitioner may become as interested as we are in the matter, and not only furnish the information as accurate and as promptly as possible consistent with their records, but will lose no time in reporting cases as soon as they come under their observation in the future. We in return promise every effort in keeping with our very inadequate appropriation to inaugurate helps of positive diagnosis, by means of examination of suspected sputum, free, and will try and distribute information to aid the medical attendant in educating his patient in the proper sanitary precaution from auto-infection and the transmission of the disease to others.

If you will kindly fill out the accompanying blank form, together with any additional information upon the subject in hand that may aid this office in serving the people, you will greatly oblige,

Yours very truly,
A. F. LONGEWAY,
Sec. State Board of Health.

On May 1st some three hundred circular letters were addressed to all physicians and those most likely to be conversant with the facts pertaining to the prevalence of tuberculosis in the State, seeking advice and information regarding the number of cases of this disease observed during the year 1901. As in other ardent efforts to acquire facts of a trustworthy nature the response was not as enthusiastic as could be desired. Some objecting to divulging the existence of the disease in their patients, as they might be annoyed by suggestions for the prevention of transmitting the infection; others from lack of interest in public sanitation, or from neglect, failed to respond at all.

Out of the three hundred letters sent but few were returned, going to show that most of them were delivered; twenty-six reported that no cases had come under their observation during the year; twenty-two physicians reported in the affirmative, having together 64 cases. Eleven having only one case each to report; nine, as the accompanying table will show, were tuberculosis of the lungs, one of the intestines and one of the heel bone, or oscalcis.

I am convinced from personal observation that this report is wholly inadequate. While tuberculosis is not very common in the State, there appears to have been many cases unreported, as many who will carefully go over the tabulated report of locality may call to mind individual cases that should have been accredited to that particular locality.

Again in the absence of a competent regulation for the reporting of vital statistics we are wholly unable to know the number of deaths caused by this communicable disease, which is responsible for over 15 per cent of all the deaths throughout the country, while in some localities it ranges from 5 to 25 per cent.

The proportion of deaths attributed to this disease in Montana in the United States census for 1900 was seven per cent of the total mortality, which is very low according to many other states. This State has not yet acquired the reputation of being specially beneficial to the cure of this class of cases, and trust that we will never have the influx of tubercular patients that have crowded some other Western states, with no less temperate and desirable climate, as they have already proven a menace and a detriment to these chosen spots, and there is serious consideration in some localities of legislating against the influx of tubercular persons.

The comparative freedom of the population of this State from tuberculosis we believe to be due to several causes which possibly, first and foremost is the healthful, invigorating atmosphere, together with the altitude which ranges throughout the State from one to eight thousand feet above the sea level, and the sparsity of population; the people the more inclined by virtue of their occupations, to live out door life, with free exercise and good food, which is most conducive to vigorous health and curative, when afflicted with tuberculosis. Furthermore the food supplied by way of meats is almost entirely free from infection, and we commend most highly the vigorous and untiring efforts of the State Veterinarian and the Stock Association in protecting this State from becoming infected with bovine tuberculosis.

Notwithstanding the statements made by so eminent an authority as Dr. Koch that bovine tuberculosis is not transmissable to man, we believe that it is a dangerous precedent to establish as the evidence at hand is entirely to the contrary. We have many individual and collective cases where it would appear that the infection was unmistakably transmitted from milk to the human subject, and we believe that it is dangerous to adopt the declaration of Dr. Koch, and be in the least lax in our efforts to protect the community from this ever present source ot infection.

It has been proven beyond question that tuberculosis is not only a communicable disease, but is positively curable particularly in the earlier stages under certain sanitary regulations. The efforts of this Board will be constantly pointed to the earnest inquiry for knowledge pertaining to the prevalence of this dread disease within the State and try to ascertain if our convictions that the disease is becoming more prevalent each year within our midst, be true. The reports of the mortality in the various counties are insufficient to enable us to speak authoritatively upon the exact percentage of mortality due to tuberculosis, but from the best information at hand, in some counties it would appear to amount to at least 8 per cent of the total death rate. In other counties where the records that are kept in the Clerk and Recorder's office have not been examined, it may be lower or even higher.

The matter of adopting rules and regulations recommended by the National Funeral Directors' Association and American General Baggage Association for the transportation of bodies dead of contagious diseases and the desirability of licensing embalmers to carry on this work and be permitted to ship such bodies was discussed by the Board at their meeting held Nov. 9th, 1901. It was concluded that such rules be adopted which make almost an unbroken chain of the Northwestern states that work under such rule, that bodies may be shipped from one state to another under the same regulations.

The undertakers of the State availed themselves with a great deal of good grace to the adoption of such rules and readily conformed to the requirements of passing an examination, which was heartily commended at the annual meeting of the Undertakers' Association of Montana, so that at our next regular meeting held in August a large majority of the undertakers throughout the State amounting to thirty presented themselves for examination and were granted licenses to ship bodies under the regulations, and at various times following, the remainder of undertakers took the examinations at such times as the Board met, until at present there is barely an undertaker in the State of any note who is not holding a license from the Board of Health. Altogether we have granted forty-seven licenses, and they are all working in harmony with the Board, realizing the great advantage to the general public to be derived by strict rules of sanitation.

The rules adopted are as follows:

Rules of the State Board of Health of Montana.

(A)—To Govern the Preparation of the Remains of Those Who Have Died of an Infectious Disease, for Transportation.

1. It shall be the duty of every funeral director, undertaker or embalmer, who may wish to qualify as competent to prepare the remains of one who has died of an infectious or contagious dis-

ease, for transportation, to comply with the following requirements:

(1) He shall make application to the State Board of Health for a license. Such application shall contain his full name, age, place of residence, and the certificate of two legal physicians of good repute, as to his general standing.

(2) The application shall be accompanied by a fee of five dollars ($5.00), which shall entitle the applicant to examination as to his fitness for such special work.

(3) He must be able to pass such examination as shall be prescribed by the State Board of Health, in

(a) Visceral anatomy of the human body.

(b) The action and comparative value of germacides.

(c) The methods of embalming.

(d) The further precautions after embalming, to insure safety in the transportation of the bodies of those who have died of an infectious disease.

(e) The meaning of infection and disinfection.

(f) Bacteriology.

(g) Such other topics as the board may, from time to time, see fit to name.

II. Such prescribed examination shall be held, under the control of the State Board of Health, at such time and place as shall be designated by the board.

III. The State Board of Health shall judge as to the fitness of any applicant for such special license after he has completed his examination.

IV. The license contemplated in these regulations shall be limited, to the term of one year, shall be signed by the president and secretary of the board, and shall have the seal of the board attached.

V. The license may be renewed annually by the payment of two dollars ($2.00) within thirty days after the expiration of the license.

VI. All licenses shall expire December 31st of the year in which they are issued. The examination fee shall also cover the license for the fiscal year in which such examination is held.

VII. The State Board of Health shall have power to refuse the granting of a license, or revoke a license granted, at any time.

VIII. The secretary of the board shall keep a record in which shall be registered the names and residences of all persons to whom a license (as prescribed) has been granted, and the number and date of the license. A copy of this record shall be furnished to all those holding a license, and also to the various transportation companies within the state.

IX. The fees collected by the State Board of Health shall be used to defray the expenses connected with the holding of examinations, the publication of registers, and such other expenses as it may see fit to apply to them to.

(B)—To Govern the Transportation of Dead Bodies.

Rule 1. The transportation of bodies dead of smallpox, Asiatic cholera, yellow fever, typhus fever or bubonic plague, is absolutely forbidden.

Rule 2. The bodies of those who have died of diphtheria (membraneous croup), scarlet fever (scarlatina, scarlet rash), glanders, anthrax or leprosy, shall not be accepted for transportation unless prepared for shipment by being thoroughly disinfected by (a) arterial and cavity injection with an approved disinfectant fluid, (b) disinfecting and stopping of all orifices with absorbent cotton, and (c) washing the body with the disinfectant, all of which must be done by an embalmer, holding a certificate as such, approved by the State Board of Health or other state health authority. After being disinfected as above, such body shall be enveloped in a layer of cotton not less than one inch thick, completely wrapped in a sheet and bandaged, and cased in an air-tight zinc, tin, copper or lead-lined coffin, or iron casket, all joints and seams hermetically soldered, and all inclosed in a strong, tight wooden box. Or, the body being prepared for shipment by disinfecting and wrapping as above, may be placed in a strong coffin or casket, and said coffin or casket incased in an air-tight zinc, copper or tin case, all joints and seams hermetically soldered, and all inclosed in a strong, outside wooden box.

Rule 3. The bodies of those dead of typhoid fever, puerperal fever, erysipelas, tuberculosis and measles, or other dangerous and communicable disease, other than those specified in Rules 1 and 2, may be received for transportation when prepared for shipment by filling cavities with an approved disinfectant, washing the exterior of the body with the same, stopping all orifices with absorbent cotton, and enveloping the entire body with a layer of cotton not less than one inch thick, and all wrapped in a sheet and bandaged, and incased in air-tight coffin or casket;

provided, that this shall apply only to bodies which can reach their destination within forty-eight hours from time of death. In all other cases, such bodies shall be prepared for transportation in conformity with Rule 2. But when the body has been prepared for shipment by being thoroughly disinfected by an embalmer holding a certificate, as in Rule 2, the air-tight sealing may be dispensed with.

Rule 4. The bodies of those dead of diseases that are not contagious, infectious or communicable may be received for transportation when incased in a sound coffin or casket and inclosed in a strong, outside wooden box, provided they reach their destination within thirty hours from time of death. If the body cannot reach its destination within thirty hours from time of death, it must be prepared for shipment by filling cavities with an approved disinfectant, washing the exterior of the body with the same, stopping all orifices with absorbent cotton and enveloping the entire body with a layer of cotton not less than one inch thick, and all wrapped in a sheet and bandaged, and incased in an air-tight coffin or casket. But when the body has been prepared for shipment by being thoroughly disinfected by an embalmer, holding a certificate, as in Rule 2, the air-tight sealing may be dispensed with.

Rule 5. In cases of contagious, infectious or communicable diseases, the body must not be accompanied by person or articles which have been exposed to the infection of the disease, unless certified by the health officer as having been properly disinfected; and before selling passage tickets, agents shall carefully examine the transit permit and note the name of the passenger in charge, and of any others proposing to accompany the body, and see that all necessary precautions have been taken to prevent the spread of the disease. The transit permit in such cases shall specifically state who is authorized by the health authorities to accompany the remains. In all cases, where bodies are forwarded under Rule 2, notice must be sent by telegraph to health officer at destination, advising the date and train on which the body may be expected. This notice must be sent by or in the name of the health officer at the initial point, and is to enable the health officer at destination to take all necessary precautions at that point.

Rule 6. Every dead body must be accompanied by a person in charge, who must be provided with a passage ticket and also present a full first-class ticket marked "Corpse," for the transportation of the body, **and a transit permit showing physician's or coroner's certificate, health officer's permit for removal,** undertaker's certificate, name of deceased, date and hour of death, age, place of death, cause of death, and if of a contagious, infectious or communicable nature, the point to which the body is to be shipped, and if death is caused by any of the diseases specified in Rule No. 2, the names of those authorized by the health authorities to accompany the body. **The transit permit must be made in duplicate,** and the signatures of the physician or coroner, health officer and undertaker, must be on both the original and duplicate copies. The undertaker's certificate and paster of the original shall be detached from the transit permit and pasted on the coffin box. The physician's certificate and transit permit shall be handed to the passenger in charge of the corpse. The whole duplicate copy shall be sent to the official in charge of the baggage department of the initial line, and by him to the secretary of the state or provincial board of health of the state or province from which said shipment was made.

Rule 7. When dead bodies are shipped by express, the transit permit must be made in triplicate, and the signature of the physician or corner, health officer and undertaker, must be on all three permits. Of these transit permits, one copy shall be pasted upon the outside of the box, one copy shall be forwarded by the express agent to the party to whom the body is shipped, and one copy shall be forwarded by the express agent to the secretary of the state or provincial board of health of the state or province from which said shipment was made.

Rule 8. Every disinterred body, dead from any disease or cause, shall be treated as infectious or dangerous to the public health, and shall not be accepted for transportation unless said removal has been approved by the state or provincial health authorities having jurisdiction where such body is disinterred, and the consent of the health authorities of the locality to which the corpse is consigned has first been obtained. All such disinterred remains shall be inclosed in a hermetically sealed (soldered) zinc, tin or copper lined coffin or box. Bodies deposited in receiving vaults shall be treated and considered the same as buried bodies.

The state or local board of health shall satisfy itself that the remains of those who have died of an infectious or contagious disease are properly prepared for transportation, according to the above rules, before issuing a certificate for shipment.

Only such local boards of health as shall be designated by the State Board of Health shall have power to grant such certificates. A list of such local boards will be furnished to the railroad officials, embalmers, etc., upon request. Local boards of health that have power to grant permits for the transportation of those who have died of an infectious or contagious disease must keep a careful record of all such permits, and must send a copy of such record to the State Board of Health at the close of each year (December 31st.)

The following is a list of the licensed undertakers bearing the date of the license also the number in the order in which they were granted. The State has seen fit to supply all printed matter in the way of shipping permits on the various railroads running through the State, and they have been zealous in performing to the letter the requirements demanding the precautions to be taken. There have been during the existence of this regulation ninety-three shipments by licensed embalmers, which fact justifies the assumption that they were properly prepared and free from the spread of any infection.

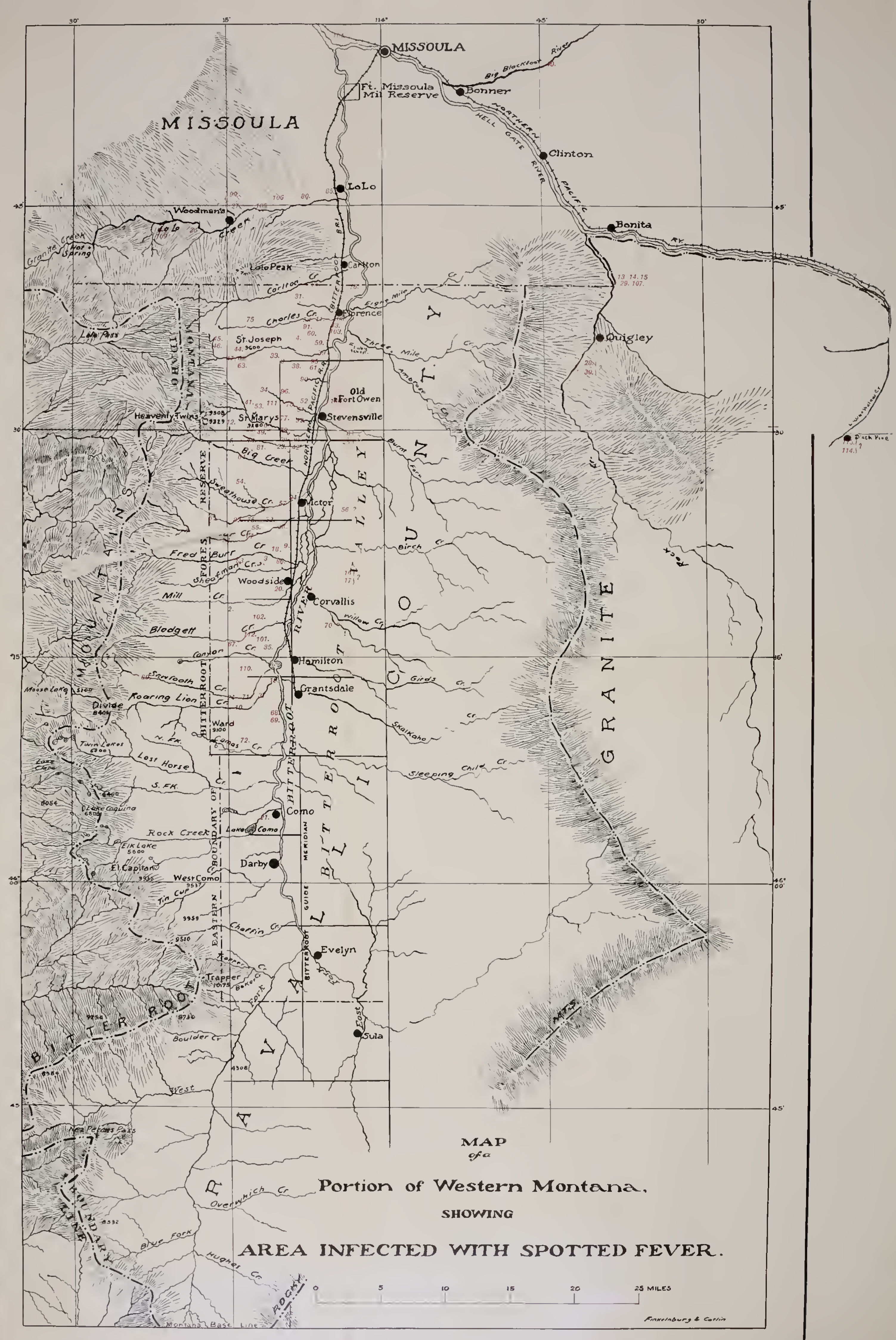
LICENSED UNDERTAKERS.

License No.	NAME	Residence	Date of Examination	Fee	For Year 1902 Date of Renewal	Fee
			1901		1901	
1	J. A. McAllister	Great Falls	Aug. 23	$5 00	Dec. 23	$2 00
2	Claus Peters	Benton	Aug. 23	5 00	Dec. 23	2 00
3	Geo. McMahon	Kalispell	Aug. 23	5 00	Dec. 18	2 00
4	Geo. Berthold	Great Falls	Aug. 23	5 00	Dec. 19	2 00
5	Fred. Powell	Boulder	Aug. 23	5 00	Dec. 11	2 00
6	John S. Cook	Belt	Aug. 23	5 00	Dec. 20	2 00
7	Wm. L. Cook	Neihart	Aug. 23	5 00	Dec. 19	2 00
8	William Davis	Townsend	Aug. 23	5 00	Dec. 30	2 00
9	John M. Lucy	Missoula	Aug. 23	5 00	Dec. 20	2 00
10	Joseph A. Hughes	Anaconda	Aug. 23	5 00	Dec. 31	2 00
11	E.J. Marnell	Anaconda	Aug. 23	5 00	*	
12	Thos. Sullivan	Butte	Aug. 23	5 00	Dec. 19	2 00
13	Geo. R. Safley	Bozeman	Aug. 23	5 00	Dec. 28	2 00
14	C. H. Virden	Twin Bridges	Aug. 23	5 00	Dec. 23	2 00
15	Joseph Richards	Butte	Aug. 23	5 00	Dec. 19	2 00
16	E. H. Brundage	Dillon	Aug. 23	5 00	Dec. 16	2 00
17	Jas. Tachell	Butte	Aug. 23	5 00	Dec. 20	2 00
18	E. H. Sherman	Butte	Aug. 23	5 00	Dec. 20	2 00
19	Miss D. M. Greenfield	Butte	Aug. 23	5 00	Dec. 19	2 00
20	F. M. Lockwood	Hamilton	Aug. 23	5 00	Dec. 23	2 00
					1902	
21	Andrew Less	Whitehall	Aug. 23	5 00	Dec. 30	2 00
22	W. H. George	Helena	Aug. 23	5 00	Dec. 20	2 00
23	F. A. Kreiger	Livingston	Aug. 23	5 00	Dec. 31	2 00
24	E. L. Flaherty	Helena	Aug. 23	5 00	Dec. 19	2 00
25	Dora Powell	Boulder	Aug. 23	5 00	Dec. 31	2 00
26	George Setzler	Billings	Aug. 23	5 00	Dec. 31	2 00
27	Herman Smith	Billings	Aug. 23	5 00	Dec. 3	2 00
28	Larry Duggan	Butte	Aug. 23	5 00	Dec. 19	2 00
29	Wm. T. Allison	Philipsburg	Aug. 23	5 00	Dec. 28	2 00
30	J. A. Underwood	Red Lodge	Aug. 23	5 00	Dec. 20	2 00
31	Edward Polley	Butte	Nov. 5	5 00	Dec. 20	2 00
32	Warrington Richards	Butte	Nov. 5	5 00	Dec. 19	2 00
33	Guy Ralph Lowe	Glendive	Nov. 5	5 00	Dec. 20	2 00
34	C. H. Marsh	Missoula	Nov. 5	5 00	Jan. 1	2 00
35	William Knight	Butte	Feb. 4	5 00	....	......
36	Minas D. Griffin	Butte	Feb. 4	5 00	....	......
37	Michael J. Walsh	Anaconda	Feb. 4	5 00	....	......
38	E. L. Conrad	Anaconda	Feb. 4	5 00	....	......
39	Ora Willoughby	Kalispell	Feb. 4	5 00	....	......
40	Nelson Willoughby	Kalispell	Feb. 4	5 00	....	......
41	Hiram Fred West	Pony	**	5 00	....	......
42	Edward McChapin	Anaconda	***	5 00	....	......
			1902			
43	Jacob Opp	Helena	July 26	5 00	....	......
44	Nellie McAllister	Great Falls	July 26	5 00	....	......
45	Frank Lemmer	Havre	July 26	5 00	....	......
46	Charles Water Todd	Great Falls	July 26	5 00	....	......
47	Charles E. Richards	Lewistown	July 26	5 00	....	......

* Not renewed.

** With examination, paid April 30.

*** Without examination, paid June 26.



MAP
of a
Portion of Western Montana,
SHOWING
AREA INFECTED WITH SPOTTED FEVER.

There have been ninety-three shipments made over the various roads traversing the State, including thirty-five who have died of communicable diseases, namely: Typhoid fever, 9; malignant oedema, 2; meningitis, 4; pulmonary tuberculosis, 6; cancer, 5; erysipelas, 1; influenza, 1; diphtheria, 2; septicaemia, 5;

LOUIS B. WILSON. M. D.
Minneapolis.
First Assistant Bacteriologist, Minnesota State Board of Health.
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and
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Minneapolis.
Junior Demonstrator in Pathology, Minnesota State University.

Shortly after the completion of the organization of the State Board of Health which occurred in April, 1901, it was urged upon the Board the advisability of investigating a peculiar localized disease of the Bitter Root Valley locally known as "Spotted Fever," which was responsible for many deaths and created more or less consternation in the minds of the residents of that valley, the cause of which was attributed to various sources, particularly the water, mineral and general conditions of the soil, and by some thought to be contained in the snow of the Bitter Root Mountains, as well as various and varied local conditions.

The Board authorized Emil Starz, State Bacteriologist and Chemist, to visit the localities infected, and if possible to start the investigation, but which was so late in the season that there were no cases then present, as the disease is confined practically to the Spring months, therefore the investigation of necessity had to be abandoned until the Spring of 1902, when, after considerable correspondence with the various practitioners and others of the valley to determine the earliest appearance of the disease, the district was visited by Emil Starz, Ph. G. of Helena, Dr. Traphagen, Ph. D. F. C. S., of Bozeman; Dr. Strain of Great Falls, and the Secretary of the Board, and after going over the ground, examining the character of the soil, water supply, etc., it was determined that none of these conditions were probably responsible for the disease, and that the investigation should be carried on by pathological and bacteriological examinations of the existing cases, therefore the secretary was authorized to

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While their report is not positively conclusive we believe that the hypothesis advanced and partially proven by them to be correct, and that the source of the disease is a great advance in the means of prevention, as they know more particularly how to avoid infection and therefore is a factor in the aim we are so desirous of accomplishing, that is preventive medicine and the protection of the community from infection and disease. We are sincerely in hopes that the means at our command may continue this investigation and prove conclusively the nature and eradication of this most fatal of complaints.

The Board feels more or less gratification with the progress made in the investigation and wish to acknowledge their appreciation of the co-operation of the physicians and many citizens in the community in lending their aid to carry on the work and securing every possible opportunity of performing autopsies and collecting material for the investigation.

In the spring of 1902 the writers were engaged by Dr. A. F. Longeway, Secretary of the Montana State Board of Health, to investigate the nature, causation and means of prevention of the disease locally known as "Spotted Fever."* One of the writers, Dr. Wilson arrived in Missoula, May 16th, 1902. On the following day a number of local physicians were met and consulted with concerning the disease. Later these gentlemen kindly gave in writing the information contained in table I (114 cases) and map I. No case being reported at the time the first few days were spent in fitting up a laboratory, certain apparatus, media, etc., having been brought from the Minnesota State Board of Health Laboratory and the rest being loaned by Dr. J. J. Buckley, Chief Surgeon of the Northern Pacific Beneficiary Association Hospital, where the use of a room was also kindly donated for the work.

Three cases examined clinically and three autopsies made during the first ten days.

May 26, Dr. Wm. M. Chowning arrived in Missoula. Both the writers remained in Missoula or the vicinity until July 14, 1902. During this time seven cases were studied clinically and autopsies performed.

The topography, meteorology and water and food supply were studied in relation to the disease. Blood and sections or organs were examined from gophers and other rodents. The possible relationship of insects, arachnid, plant pollen, etc., was considered. Numerous bacterological cultures were made from six of the clinical cases and from various organs from all the autopsies.

Early in the investigation a hitherto-undescribed haematozoan was discovered in the red blood cells or patients suffering from the disease. Much time was spent in attempting to solve the various problems connected with its life history, probable mode of tranferrance to man, etc. Enough was accomplished to warrant the formulation of a working hypothesis (see hypothesis page 59 mss.) etc., that the so-called "Spotted Fever" is due to the presence in the patient's blood of the above mentioned haematozoan whose normal habitat is the red blood cell of the grey gopher, **Spermaphilus Columbianus**; and that the parasite is conveyed to man through the bite of a tick which has previously become infected from a gopher. A vast amount of work yet remains to be done before the truth or falsity of this latter hypothesis can be shown.

During the investigation the most generous assistance was received from the State Universities of Montana and Minnesota, the State Board of Health of Minnesota, the Northern Pacific Beneficial Association and its chief and assistant surgeons, Drs. J. J. Buckley and E. W. Spottswood and from all the physicians of Missoula and the Bitter Root Valley. To all these the writers desire to express their most sincere thanks.

During the last week of June, 1902, Dr. F. F. Westbrook, Professor of Pathology and Bacteriology in the University of Minnesota and Director of the Minnesota State Board of Health

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*The name "Spotted Fever" as applied to the disease under consideration is an unfortunate one since it has been applied to several other diseases. The writers while desiring to comply with the request of several physicians of the Bitter Root Valley to propose a scientific name for the disease, and while reserving their right to propose a name for the haematozoan causing the disease, think it unwise at the present time to burden scientific terminology with descriptive names which may need modification after another year of study.

Laboratory, and Dr. J. O. Cobb, Surgeon of the U. S. Public Health and Marine Hospital Service, visited Missoula and in company with Drs. Brice and Buckley and the writers examined clinically case number 96. They also examined fresh blood preparations from this case and gross and miscroscopic specimens from previous autopsies and gophers.

Dr. Westbrook kindly made during his observations on fresh blood from case 10 the original sketches from which plate number III, was reproduced.

Dr. Westbrook's report of this trip will be found in the Biennial report of the Minnesota State Board of Health for 1901-2 and that of Surgeon Cobb in the U. S. Public Health and Marine Hospital Service Reports for 1902, page 1868.

History.

The disease known in Montana as "Spotted Fever" had been recognized as a distinct clinical entity by the physicians of the Bitter Root Valley for fifteen or twenty years, but the only article in a medical journal hitherto published concerning it is that by Dr. E. E. Maxey, in the Portland Medical Sentinel, for October, 1899. Two other papers, by Drs. R. Gwinn and G. T. McCullough, were read at the May, 1902, meeting of the Montana State Medical Association. These three deal very clearly with the history and clinical symptoms, but the pathology and etiology, we believe, have not hitherto been reported on.

So far as can be determined, the first case of "spotted fever," "black fever" or "blue disease" in the Bitter Root valley in Montana occurred in 1873. At this time there were but few white men in the valley. No authentic information of its occurrence among the Indians—who until 1890 inhabited the valley—has been obtained, though many old residents, including Indians, white trappers traders and Catholic priests were consulted.

Since its first appearance probably 200 cases of the severe type have occurred, 70 to 80 per cent. of which have been fatal. During the spring of 1902 18 such cases developed, 15 of these died and 3 recovered.

In order to determine the number and distribution of as many cases as possible the following letter was sent with a blank list and blue print map of the district to each of the physicians of the locality.

Missoula, Mont., June 11, 1902.

Dear Doctor:—It is very desirable that at least the more recent cases of "spotted fever" be listed and mapped. This can be accomplished only by each physician recording as fully as possible his own cases. Enclosed you will find a blank list and a map for making such record. Unless you have complete records of all your cases, it is suggested that you start the blank with your cases for this year, then give those for 1901, then for 1900, etc. Go back in this manner as far as you are able to give accurate data and then give an estimate of your previous cases. Number each case on the list and place a corresponding number on the map at the point where the patient contracted the disease. Where you are in doubt at which of two points the disease was contracted, place the case number on both with a "?" mark after the less likely one. The value of the list will be greatly increased by a full "Remarks" column. Please return the completed list and map at your earliest convenience, if possible before June 20.

I realize, doctor, that this is asking a great favor of you and assure you that it will be greatly appreciated.

Sincerely yours,
LOUIS B. WILSON.

P. S. Writing may be done most clearly on Blue Print map with a pen dipped in a strong solution of common baking soda though any light colored ink or lead pencil may be used.

Replies were received from all the physicians except one who had treated cases of the disease. Most of the physicians listed only cases of the severe type though a few mild cases were list-

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1. Dr. Maxey's paper describes cases in Idaho mostly along the southern foothills of the Boise Mountains. The cases seem to be limited largely to the north side of the Snake River Valley from Seven Devils to Haley, and to occur from the latter part of March to middle of July. After the publication of the writer's preliminary report in the Journal of The American Medical Association, July 19, 1902, W. M. Wood, Major Surgeon U. S. Army, presented the writers with a copy of a series of letters which sented the writers with a copy of a series of letters which he received from a number of physicians in Idaho in 1898 in response to his inquiries concerning "spotted fever" in that state. Major Wood presented a symposium of these letters in a report to the Surgeon General of the U. S. Army in 1898 but so far as the writers are aware, this report has not been published. This symposium with Dr. Maxey's paper and a number of communications received by the writers from physicians in Idaho seem to make it certain that the disease known as "spotted fever" in Montana has also a definite distribution in Idaho, and that it resembles very closely the disease in Montana in all respects except in its comparatively very low mortality.

ed by some who felt certain of their ability to diagnose such cases. Some doubt as to the diagnosis was expressed by the reporter, by another physician who saw the case in consultaton, or suggested by the attendant circumstances in cases Nos. 11, 18, 19, 37, 40, 108, 113 and 114. Several of the physicians stated that their lists for the years prior to 1899 were very incomplete since their records had been mislaid. No cases are reported as occurring before 1885. The only case prior to this time of which any history can be obtained is that of J. W., who died in May, 1873 near Woodside. The physician who attended the case is dead. Certain of the patient's relatives and neighbors who have had subsequent acquaintance with the disease, give a reasonably clear history of symptoms which would indicate that the man died of "spotted fever." The cases reported by physicians were arranged in chronological order, and are as follows:

TABLE I – Showing Cases of Spotted Fever

Case No.	Physician's Name and Address	Year	Date of Onset of Sympt'ms	Patient's Initials	Sex	Age	Occupation
1	J. F. Coughenour, Corvallis	1885	June 25	J. M.	Male	36	Prospector
2	J. F. Coughenour Corvallis	1886	May 3	H. T.	Male	30	Lumberman
3	J. F. Coughenour, Corvallis	1888	May 7	Mrs. W	Female.	37	Housekeeper
4	R. Gwinn, Missoula	1888	Spring	F.	Male	35	....
5	R. Gwinn, Missoula	1888	Spring	....	Male	25	Laborer
6	R. Gwinn, Missoula	1889	Spring	Half-breed	Male	20	....
7	R. Gwinn, Missoula	1889	Spring	....	Female.	6	....
8	R. Gwinn, Missoula	1889	Spring	....	Male	12	....
9	J. F. Coughenour, Corvallis	1890	June 22	W. J.	Male	30	Laborer
10	J. F. Coughenour, Corvallis	1891	June 17	D. S.	Male	40	Farmer
11	E. A. Crain, Missoula	1891	....	L. D.	Female.	*17	Farmer's daughter
12	W. B. Parsons, Missoula	1891	May ..	Z. H.	Male	35	Hotel
13	W. B. Parsons, Missoula	1891	May 20	F. C.	Male	48	Trapper
14	W. B. Parsons, Missoula	1891	May 26	C. M.	Male	51	Trapper
15	W. B. Parsons, Missoula	1891	July 20	L. P.	Male	10	....
16	J. F. Coughenour, Corvallis	1892	Apr. 27	Mrs. J. C.	Female.	26	Housekeeper
17	J. F. Coughenour, Corvallis	1892	June 2	Mrs. C.'s babe	Male	2d	....
18	E. A. Crain, Missoula	....	....	Name forgotten.	Male	*30	Laborer
19	E. A. Crain, Missoula	....	....	Mrs. M. G.	Female.	*28	Housewife
20	Geo. McGrath, Hamilton	1893	June ..	....	Male	*11	....
21	Geo. McGrath, Hamilton	1893	May ..	....	Male	*40	Laborer
22	J. T. Brice, Stevensville	1895	May ..	O. O.	Male	45	Farmer
23	J. T. Price, Stevensville	1895	May ..	Mrs. A. A.	Female.	40	Housewife
24	Geo. McGrath, Hamilton	1895	May ..	....	Male	*8	....
25	J. T. Brice, Stevensville	1896	May ..	J. S.	Male	44	....
26	J. J. Buckley, Missoula	1896	June ..	....	Male	26	Lumberman
27	G. T. McCullough, Missoula	1896	May 1	Ed. W.	Male	26	Ranchman
28	W. B. Parsons, Missoula	1896	May ..	G. B.	Male	32	....
29	W. B. Parsons, Missoula	1896	May ..	F. L.	Female.	18	....
30	W. B. Parsons, Missoula	1896	May ..	— P.	Male	....	....
31	J. T. Brice, Stevensville	1897	May ..	J. F. W.	Male	60	Farmer
32	J. T. Brice, Stevensville	1897	May ..	J. N.	Male	*60	Farmer
33	J. T. Brice, Stevensville	1897	Apr. ..	R. C.	Male	21	Farmer
34	J. T. Brice, Stevensville	1897	June ..	Mrs. C. M	Female.	40	Housewife
35	J. J. Buckley, Missoula	1897	Spring	....	Male	30	Lumberman

* About.

orted by Physicians of Western Montana.

out What Day of Illness Did Spots Appear	Death on What Day of Disease, or Convalescence Beginning About What Day	Remarks
	Died 11th day	Made 3 visits July 2d. 3d, 4th, 1885. Spots present at my first visit. Diagnosed case "Typhoid Fever."
	Died 11th day	
	Beginning of lysis on 15th day	
	Died 6th day	
r 4th	Conval. 18th day	
	Died 5th day	
	Died 7th day	
	Died 7th day	
	Died 11th day	
	Died 10th day	
record	Recovered	This case occurred in a year when there were many deaths from Spotted Fever, from Carlton to Corvallis. It was then called by the Valley physicians "Black Measles."
	6th day	This man lived in Stevensville. A short time before he was taken sick, he was on the west side of the river and slept out in the mountains.
	7th day	
	6th day	
	2 or 3 weeks	
	Died 8th day	Mrs. C. had been delivered of male babe 4 days before her death. Early in the second morning after birth the babe's grandmother called my attention to the child's fevor and jaundiced appearance. Had but few spots, began to get better on 9th or 10th day of his sickness.
but little uption	Began to get better on 9th or 10th day	
record	Recovered	I can give no good account of them, the man, as near as I can remember was under my care for about 3 weeks, then went to his relations at Wausau, Wis. The case of the female was slight.
record	Recovered	
	Died about 13th day	
	Died 12th day	
	Died 8tn day	
	Died 12th day	
't remember	Died about 11th day	Considerable swelling of legs and face last day or two.
	Died 10th day	
not say	Died about 8th day	Impossible to find any records in this case in St. Patrick's Hospital Records.
	Died 8th day	
ut 3d day	Died in few days	
ut 3d day	Died in few days	
ut 3d day	Died in few days	
	Died 9th day	
	Died 8th day	
	Died 10th day	
	Died 8th day	
	Died 8th day	Case came from Hamilton, and taken to St. Patrick's Hospital, only lived 2 days. Was broken out thoroughly on arrival, could get no history from him. A post-mortem held, only thing apparently abnormal was Spleen largely increased in size.

TABLE

Case No..	Physician's Name and Address	Year....	Date of Onset of Sympt'ms	Patient's Initials	Sex	Age....	Occupation
36	J. J. Buckley, Missoula	1897	Spring..	J. H....	Male.....	27	Farmer
37	J. W. Howard, Hamilton	1898	June 27	A. D....	Male.....	43	Farmer
38	J. T. Brice, Stevensville	1899	May 19	D. M....	Male.....	14	School Boy
39	J. T. Brice, Stevensville	1899	June ..	W. H....	Male.....	30	Farmer
40	C. A. Crain, Missoula	1899		H. M....	Female.	12	
41	R. Gwinn, Missoula	1899	June ..	M..	Male.....	30	Farmer
42	R. Gwinn, Missoula	1899	June ..	W. Mrs	Female.	39	Housewife
43	R. Gwinn, Missoula	1899	June ..	B....	Male.....	18	Farmer
44	R. Gwinn, Missoula	1899	June ..	F....	Male.....	45	Farmer
**	R. Gwinn, Missoula	1899	June ..	T. (2 children)..	M. & F..	3—5	
47	R. Gwinn, Missoula	1899	June ..	J. T.....	Male.....	50	Prospector
48	R. Gwinn, Missoula	1899	June ..	Mrs. J. A....	Female.	40	Housewife
49	R. Gwinn, Missoula	1899	June ..	Mrs. S....	Female.	45	Housewife
50	R. Gwinn, Missoula	1899	June ..	M. V....	Female.	9	
51	R. Gwinn, Missoula..	1899	June ..		Male.....	30	Lumberman
52	R. Gwinn, Missoula	1899	June ..		Male.....	30	Lumberman
53	R. Gwinn, Missoula	1899	June ..		Male.....	33	Lumberman
54	T. H. Hanbridge, Victor	1899	Apr. 24	L. W.	Female.	12	School girl
55	T. H. Hanbridge, Victor	1899	May 4	Mrs. B. W..	Female.	18	Housekeeper
56.	J. W. Howard, Hamilton	1899	July ..	— — J....	Male.....	2½	
57	J. W. Howard, Hamilton	1899	July ..	H. M....	Male.....	2½	
58	J. W. Howard, Hamilton	1899	June 25		Male.....	35	Sawmill man

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** 16 and 46.

Continued.

About What Day of Illness Did Spots Appear	Death on What Day of Disease, or Convalescence Beginning About What Day	Remarks
4th	Recovery	This man was seen by me in consultation with the late Dr. G. P. Mills who had charge of the case. It presented the usual type. He had marked delirium was abundantly "spotted" but made a good recovery.
About 4th day	Recovered at the end of the 4th week after attack. Dismissed at end of 5½ weeks from date of attack	Was called to see this case on July 9th, he having been attended by others prior to this. Found him entirely comatosed and learned that had existed for 3 days prior. Respirations hurried. Temperature but silghtly above normal and the petechic abundant. Many of which, by their coalescence made a spot as large as 1 inch in width and 2 or 3 in length, all of which—later on—formed dry gangrene and sloughed to a depth including deep fascia.
3rd	Recovered	
4th	Died 10th day	
No record	Recovered after about 3 weeks treatment	Child from 'Big Blackfoot' Country, after disease was well developed. The spots were not as general as in the cases I had before, and were only general in distribution over the region of shoulders and spine.
3d	Died 10th day	
3d	Died 8th day	
2d	Died 4th day	
3d	Died 7th day	Complicated with pneumonia.
3d	Died 7th day	
2d	Died 3d day	Very violent attack after exposure.
3d	Convalescent 21st	
3d	Convalescent 21st	
4th	Convalescent 42d	Mild and prolonged attack.
3d	Died 6th day	
	Died 6th day	
3d	Died 5th day	Relapsed after abortive treatment.
2d	Died 6th day	
4th	Convalescence set in in 12th day. Fever dropped entirely out 22d day	
4th of 5th	Recbvered. Conval. began 10 days after coming under my observation and was dismissed at the end of 3½ weeks	Temperature about 103; pulse exceedingly rapid; respiration between 40 and 50; Petechia well defined and abundant, extreme prostration and marked jactitation—the foregoing symptoms continued until beginning convalescence.
Do not know	Recovered. Conval. began at about the end of 3rd week after attack but not dismissed for about 4½ weeks from the date of attack	Symptoms same as case No. 56, but in a more advanced stage, with a correspondingly increased state of Petechia.
3d or 4th	Died. Saw patient first at about 9 P. M. and he died at about 8 the next A. M.	

TABLE

Case No.	Physician's Name and Address	Year	Date of Onset of Sympt'ms	Patient's Initials	Sex	Age	Occupation
59	J. T. Brice, Stevensville	1899	May ..	B. R.	Female.	3	None
60	J. T. Brice, Stevensville	1899	Apr. ..	Mrs. J. W	Female.	22	Housekeeper
61	R. Gwinn, Missoula	1900.	June ..	F. T.	Male.	70	Farmer
62	R. Gwinn, Missoula	....	June ..	L. Mrs.	Female.	35	Housekeeper
63	R. Gwinn, Missoula	....	....	....	Male.	30	Laborer
64	T. H. Hanbridge, Victor	1900	Apr. 30	Mrs. A..	Female.	42	Housekeeper
65	T. H. Hanbridge, Victor	1900	May 13	K	Male.	4	
66	T. H. Hanbridge, Victor	1900	May 18	Baby	Female.	1½	
67	T. H. Hanbridge, Victor	1900	Apr. 15	R. B.	Male.	40	Stone mason
68	Geo. McGrath, Hamilton	1900	May 2	T.	Male.	*9	
69	Geo. McGrath, Hamilton	1900	May 8	B	Male.	*2½	
70	Geo. McGrath, Hamilton	1900	May 6	H..	Female.	*10	
71	Geo. McGrath, Hamilton	1900	Apr. ..	Mrs. W..	Female.	*40	Housewife
72	Geo. McGrath, Hamilton	1900	Apr. 16	Mrs. M.	Female.	*55	
73	Geo. McGrath, Hamilton	1900	June ..	— N.	Male.	*17	
74	Geo. Putneyw, Missoula	1900	Mar. 30	F. L..	Female.	*20	None
75	H. F. Brethour, Hamilton	1901	May 6	S.	Male.	25	Lumber Jack
76	J. T. Brice, Stevensville	1901	May ..	B.	Female.	3	None
77	J. T. Brice, Stevensville	1901	May ..	J. P.	Male.	25	Laborer
78	J. T. Brice, Stevensville	1901	May 24	— R.	Male.	12	School Boy
79	J. T. Brice, Stevensville	1901	May ..	R	Female.	13	School Girl
80	J. J. Buckley, Missoula	1901	May 17	A. H.	Female.	18	Attending school
81	T. H. Hanbridge, Victor	1901	Apr. 20	R. C.	Male.	62	Laborer
82	T. H. Hanbridge, Victor	1901	Apr. 2	G. B.	Male.	35	Laborer
83	T. H. Hanbridge, Victor	1901	May 4	Mrs. R.	Female.	62	Housekeeper
84	T. H. Hanbridge, Victor	1901	July 12	M. B.	Female.	7	
85	G. T. McCullough, Missoula	1901	Mar. 27	B. R.	Female.	3	
86	G. T. McCullough, Missoula	1901	Mar. 20	J. F.	Male.	34	Lumberman
87	Geo. McGrath, Hamilton	1901	July 1	Mrs. M. H.	Female.	*37	Nurse
88	W. B. Parsons, Missoula	1901	June ..	J. H.	Male.	35	Lumber Jack
89	N. F. Brethnour, Hamilton	1902	May 13	Mrs. J. D.	Female.	33	Housewife

* About.

Continued.

About What Day of Illness Did Spots Appear	Death on What Day of Disease, or Convalefcence Beginning About What Dav	Remarks
3d	Died 9th day	
3d	Recovered	Sent to Sister's Hospital, Missoula. Sick about 24 days, 2 months, before recovery was complete. Treated by Dr. W. P. Mills at Hospital.
7th	Died about 7th day	Had a low fever record—eruption well marked.
3d	Died about 14th day	
3d	Died about 7th day	Complicated by gangrene
3d	11th day	
2nd..	6th day	
3d	8th day	No. 66 is a niece of No. 82 and died the year before.
4th	7th day	
3d	Last visit May 25, 1899	Recovered.
Can't tell at 1st visit	Last visit May 20	Recovered.
About 5th day	Last visit May 23, 1902	Recovered.
3d, so says husband	Died on 3rd day of eruption	First and last visit the morning of day she died.
4th so says her son	Died of tenth day of disease	Considerable swelling of legs and face the last 2 or 3 days.
Don't know	Died about 13th day	
About one week after first symptoms appeared, but the symptoms came on gradually and I did not see her during first 6 or 7 days, so I can not say definitely	Died on 11th day	In this case the symptoms were about three days in reaching their heighth. She became slightly more ill with malarial fever, etc., each day, very much as a very malignant case of typhoid would do. Delirium about fourth day. Hypostatic pneumonia beginning at this time. I saw her first at the end of the first week, when she had been delirious for three days. She is supposed to have contracted the disease at Quigley, where she was visiting just previous to her illness.
6th	Conval. 16th day	Complicated with pneuomnia, patient especially rugged.
3d	Died 10th day	
3d	Died 9th day	
3d	Recovered	Sick 23 days when convalescence began. Disease taken regular course from onset. First symptom same as other cases of same disease.
3d	Died 8th day	
5th	Recovery	This patient made a good recovery though a very severe case and remarkably well spotted.
3rd	Died 5th day	No. 81, this patient drank no water during the season.
4th	Died 7th day	
4th	Died 11th day	
4th	Died 8th day	No. 84, this is a daughter of No. 82, but was not living on the same ranch.
Abouth 4th	Died 7th day	
About 5th	Died 10th day	
3rd	Recovered 21st day	
3rd	Died 6th day	
3rd	Died 11th day	Very typical case. Patient conscious until hour or two before death. Full report obtained before.

TABLE I

Case No..	Physician's Name and Address	Year....	Date of Onset of Sympt'ms	Patient's Initials	Sex	Age....	Occupation
90	J. T. Brice, Stevensville ...	1902	Apr. 20	Mrs. E. B....	Female.	*40	Housekeeper ....
91	J. T. Brice, Stevensville ...	1902	May 18	A. G	Male.....	22	Farmer ....
92	J. T. Brice, Stevensville ...	1902	Apr. 27	Mr. E......	Male.....	74	Farmer ....
93	J. T. Brice, Stevensville..	1902	May 24	J. A. P....	Male.....	*23	Laborer ....
94	J. T. Brice, Stevensville ...	1902	Mary 25	A. R.	Female.	*6	None ....
95	J. T. Brice, Stevensville ..	1902	June 3	J. O. Jr......	Male.....	2	None ....
96	J. T. Brice, Stevensville ...	1902	June 17	D. McD....	Male.....	31	Lumberman .....
97	J. C. Burton (D. O.) Missou	1902	May 23	Mrs. V. R. W....	Female.	65	Wife of Farmer.
98	R. Gwinn, Missoula	1902	June 1	B. J. H....	Male.....	38	Timber inspector
99	R. Gwinn, Missoula	1902	Apr. 22	McN..	Female.	30	Housekeeper ....
100	R. Gwinn, Missoula	1902	Apr. 8	B. J....	Male.....	45	Common labor .
101	Geo. McGrath, Hamilton ..	1902	Mar. 17	A. M.	Female.	12	School girl ......
102	Geo. McGrath, Hamilton ..	1902	Apr. 13	W. E.....	Male.....	9	School boy ......
103	Geo. McGrath, Hamilton ..	1902	Apr. 16	A. F....	Male.....	35	Laborer ....
104	G. T. McCullough, Missoul	1902	Apr. 20	C. D.	Male.....	20	Teamster ....
105	G. T. McCullough, Missoul	1902	Apr. 10	P. W.	Male.....	9	....
106	Dr. W. B. Parsons, Missou	1902	Apr. 12	McG....	Female.	4	None ....
107	Dr. W. B. Parsons, Missou'	1902	May 10	H. M....	Male.....	9	None ....
108	Dr. W. B| Parson, Missoul	1902	May 25	G. R....	Male.....	52	Farmer ....
109	E. W. Spottswood, Missoula	1902	May 6	J. W....	Male.....	40	Lumber Cruiser .

* About.

Continued.

About What Day of Illness Did Spots Appear	Death on What Day of Disease, or Convalescence Beginning About What Day	Remarks
d	Died 9th day	Saw patient first in my office on second day of illness complained of. Pains in head, back, upper and lower limbs, soreness of muscles in all parts of body. Temperature, 102d; Pulse, 90; Resp. 24. Temp. did not raise above 103, was normal 24 hours before death.
th	Died 8th day	
Unknown	Died about 9th day	Saw him first about 3 hours before death. Had been alone most all the time, could get no history. Spots well defined.
3d	Died 7th day	
d	Died 11th day	
3d	Died 18th day	
3d	Died 13th day	Saw him first 33 hours after onset of disease. Hostory same as above. Temp. 103; Pulse, 90; Resp. 24. Taken regular course of disease. Died on 13th day.
About 5th day	Died 6th day	Case No. 97 began with chills and vomiting with a rapid rise of temperature. Bowels were loose from onset of disease, urine scanty and highly colored. At first visit two days after onset of disease found temperature 105 d; Pulse rate 104, and respiration 32. The temperature was kept under 103 d. by the use of baths, the pulse rate did not vary materially, and the respirations gradually increased to 45 per minute. Ten hours before death occurred temperature fell to 95 d. and the spots all became darker.
A few 3d day	Conv. 8th day	Abortive treatment—Blood showed protozoon.
9th	Conv. 10th	Abortive treatment used by patient at first attack.
9th	Conv. 9th	Abortive treatment—Threatened gangrene of right toes.
About 4th	Recovery 21st day	Circulation quite rapid at end of two months time.
About 4th	Died Apr. 23d, 10th day	Delirious much of the time after April 17th until death.
4th	Died about 12th day	
About 5th	Recovered	Convalescence beginning about 12th day of disease.
About 3d	Died 9th day	
3d	Died 6th day	
3d	Died 6th day	
3d	Recov. in 3 weeks	No. 108 is the only one which recovered. He had been bitten by two ticks a few days before taken sick.
3d	Died 9th day	

TABLE

After the above cases had been arronged in chronolog

Case No.	Physician's Name anp Address	Year	Date of Onset of Sympt'ms	Patient's Initials	Sex	Age	Occupation
110	Dr. Owen, Hamilton	1892	Apr. 16	Mrs. S....	Female.	55	Housewife .....
111	Dr. Owen, Hamilton	1898	May 25	R. McF....	Male.....	30	....
112	Dr. Owen, Hamilton	1898	June 10	Mrs. J. H........	Female.	24	Housewife .....
113	T. G. Heine, Butte	1893	***	W. H....	Male.....	*34	Miner ....
114	T. G. Heine, Butte	1893	****	Mrs. W. H.......	Female.	*30	Housewife ....

* About.
*** Early in March.
**** 10 days later than husband.

Continued.

order. notes on the following five cases were received:

About What Day of Illness Did Spots Appear	Death on What Day of Disease, or Convalescence Beginning About What Day	Remarks
4th	Convalescence began about 18th day. Last medicine given five weeks after onset of disease	
Death on 8th day		
Death on 9th day		
This I am not certain but I think about 8 or 10 days	Conval. about 4th wk	Convalescence very slow in each case, it was about 10 or 12 weeks before they could work, and their health was never so good afterward while I knew them.
About 8 or 10 days	Little earlier than husband	

Location.

The cases of "spotted fever" in Montana are confined to the eastern foothills of the Bitter Root mountains (a range along the top of which runs the Montana-Idaho state line), namely, on the western side of the Bitter Root valley in an area from four to ten miles wide and fifty miles long. Few, if any, cases have ever been known to originate in Montana outside of this territory except eight in an area about a half mile wide and ten miles long in the narrow canyon of Rock creek about 20 miles east of the Bitter Root valley. On the map showing cases listed by physicians, seven are noted as occurring on the east side of the Bitter Root river. There is reason to believe, however, that each of these cases, except 17 qv, were originally infected on the west side of the river. There is nothing to indicate where case No. 104—on the north side of the Hell Gate river below Missoula—received its infection. If cases Nos. 40, 113 and 114 were correctly diagnosed they show two other foci of the disease.

The limitation of cases to the west side of the valley is strikingly shown by the following map on which are indicated by number all the cases (114) reported by physicians.

The Bitter Root range of mountains is very rugged, the top being covered with snow until about July 1, and some peaks capped throughout the year. The range on the east side of the valley is less rugged, though the snow remains almost as long in spring as on the west side. On the foothills the snow melts from sunny exposures as early as February, the bulk of it disappearing in April and May. The climate of the valley is very mild, as is evidenced by the many orchards of apple, pear, cherry and plum trees. The altitude of the valley is about 3,500 feet above sea level.

The population of the valley is made up largely of fairly well-to-do ranchers, the majority of whom have come from Missouri, Georgia and the Carolinas. They are, as a rule, cleanly and healthy. The lumber industry is an imported one in the valley and many cases of "spotted fever" have arisen about sawmills and on ground recently cleared of timber.

Season.

The disease occurs only in the spring. The earliest recorded case began March 17, and the latest about July 20, though most cases occur between May 15 and June 15. There are no records of any cases occurring between July 20 and March 17, though there are rumors of some cases having occurred as early as February. The following table compiled from table one shows the distribution by months of the reported cases:

Table II Showing Distribution of Cases by Months.

In March 6 cases have occurred.
In April 19 cases have occurred.
In May 43 cases have occurred.
In June 31 cases have occurred.
In July 5 cases have occurred.
In Spring, but exact month uncertain, 10 cases have occurred. Total 114.

Previous Condition of Patient.

The general health of the patient appears to have little part in determining susceptibility to the disease. A large number of cases give a history of recent exposure to wet or cold or of over-exertion shortly before the attack. But in several cases all such history has been absolutely excluded. Many of the patients had suffered somewhat from indigestion and constipation immediately prior to the attack. In others no such condition existed.

Sex and Age.

The relationship of sex and age to susceptibility and mortality is shown in the following table compiled from table I.

TABLE III.—SHOWING FATAL AND RECOVERY CASES ARRANGED WITH REFERENCE TO AGE AND SEX OF PATIENTS.

	MALES			FEMALES			Total Cases, Both Sexs
	Fatal Cases....	Recovery Cases.	Total Males....	Fatal Cases ...	Recovery Cases.	Total Females..	
Under 5 years	4	4	8	5	......	5	13
5 to 10 years	5	1	6	3	2	5	11
10 to 20 years	5	3	8	4	5	9	17
20 to 30 years	13	4	17	3	4	7	24
30 to 40 years	16	3	19	6	3	9	28
40 to 50 years	6	2	8	1	1	2	10
50 to 60 years	2	1	3	1	1	2	5
60 to 80 years	3	......	3	2	......	2	5
Age not stated	1	......	1	......	......	......	1
Totals	55	18	73	25	16	41	114

The cases are too few to warrant the drawing of elaborate conclusions where such varying factors are concerned. It is probable, however, that the large number of cases occurring in males of 20 to 40 years and in females of somewhat younger age is due to the increased exposure to infection through their occupation or pleasure taking them outdoors in the foothills and mountains in the spring of the year.

Types of the Disease.

Most physicians in the Bitter Root valley who have had experience with the disease recognize but one type, a severe and usually fatal form, the principal diagnostic feature of which is the "spots." Several physicians, however, recognize in addition a mild type in which there are no "spots." There is much difficulty in the accurate diagnosis of the mild type, and though its existence must be recognized, yet, during the investigation herewith reported, all of the examinations except one were made on cases of severe type. The type of the disease which appears in Idaho, as described by Dr. Maxey, Major Wood and other physicians of that State, is apparently very much milder than that of the severe form appearing in Montana, though the cases all show the peculiar eruption.

Clinical Histories and Autopsy Notes.

The following protocols of clinical and autopsy observations are presented as a basis for a summary of symptoms and lesions:

Case No. 1. (No. 109 on Table and Map). Patient of Dr. Spottswood, Missoula, Montana.

W. J. W. Male. Age 40 years. Weight 160 pounds. Height 5 ft. 10 1-2 inches. Robust man of healthy appearance. Previous health good. Since fall 1901 had been employed as timber cruiser along the Bitter Root river in the mountains and along the various streams emptying into the Bitter Root. Had been on the east side until Feb. 1902, when he began work on the west side. During the winter and spring had been sleeping in a tent and using water out of the various streams. Came to his home in Missoula on May 3, feeling well though tired, having just completed a very exhausting trip in the mountains on the south side of Lo Lo creek. He returned to his work on May 5, on which day he began to feel badly, having chilly sensations, slight headache and tired feeling. He came back to his home in Missoula on May 6. In the forenoon of which day Dr. Spottswood examined him. His temperature was 103; pulse 120. His face was flushed, tongue slightly coated, white and moist. Bowels were inclined to constipation. In the afternoon of the same day his temperature was 102 and it remained from 102 to 103 3-5—in each observation made daily—until about 6 hours before his death, when it began to decrease. Eruptions appeared May 8 (third day of the disease) showing first on the abdomen and gradually extending to the chest, body and limbs. Did not appear on the face and scrotum until after May 13. On May 13 Drs. Spottswood and Parsons noted that the eruption was petechael and resembled the spots on a turkey egg though redder. On this date it disappeared on pressure in some places but not in others; especially not on the buttocks where it was much redder in color than elsewhere. At this time the pulse was 84, full and soft. Respiration 36; temperature 102. Tongue was dry, yellowish coated in the middle, red at the tip and along the edges. Sticky mucus adhered to the roof of the mouth. Pupils were normal in response to light and shade. At this time patient said that at the beginning of his sickness he had had "bothersome dreams" with ringing in his ears and that he had been partially deaf for two or three days. The mind at this date, May 13, seemed clear. Skin of the face was possibly a little dusky. The skin, especially on feet and legs, was very sensitive to the touch and about normal as to moisture. Patient coughed occasionally and with difficulty raised a tenacious mucus. There was very slight restlessness. Bowels were normal. The urine was straw colored and contained a trace of albumen. There was no stiffness of the muscles of the neck or back, though some pain was present on pressure over the spinal process of the veretebrae, especially those in the dorsal lumbar region. The conjunctivae were congested and there was a very slight tinge of yellow in the conjunctivae. At 11:30 A. M. May 15, Drs. Spottwood and Parsons made the following notes: Pulse, weaker, 90; temperature, 100 4-5; respirations, 36 and quick. Chin Spottswood and Parsons made the following notes: Pulse, weakhands and arms constantly when eyes are closed. When aroused he talks rationally, though only to answer questions: complains of no pain. Has hiccough. Pupils small but respond normally to light. Finger and toe-nails are cyanotic, but lips are not, ears are cyanotic. Eruption since May 13 has become more purple in color. Spots are larger, having coalesced. Some are very large, covering several square inches and of different shapes.

They appear to be suggilations resembling very much those in dead bodies. The eruption has appeared on scrotum and face. Bowels and kidneys are acting normally. During afternoon of May 15 patient rapidly sank. The heart becoming weaker and weaker, respiration more rapid until he died at 5:30 P. M., May 15.

Post Mortem Examination.—May 16, 1902, at 8 P. M. (28 hours after death) body was examined by Drs. Spottswood and Wilson. Embalming by cavity injection of about 2 quarts of a fluid compound mostly of formaldebyde had been completed 12 hours previously. An autopsy was absolutely refused.

The skin was covered with purpuric spots from 1 mn. to 10 c. m. in diameter. The surface of the skin over the left thigh—non-dependent portion—was washed off with ether, a small incision made with a sterile scalpel and about 1-8 c. c. m. of tissue removed from the muscle with a sterile curette. A similar specimen was removed in the same manner from the purpuric subcutaneous tissue of a dependent portion of the thigh. These portions of tissue were used for inoculating agar, broth and serum media and for making direct coverslip preparations.

Case No. 2. (No. 107 on Table and Map.)

H. M.—Male, age 4. Patient of Dr. W. B. Parsons. Resident of Rock Creek valley, 9 miles south of Bonita since May 3, 1902, prior to that time a resident of Anaconda where in March, 1902, had a typical case of measles from which full recovery had been made. After moving to Rock Creek locality the child had been perfectly well to May 16, though he had been bitten very frequently by ticks which were numerous. May 16 he seemed drowsy and feverish and inclined to drink much water. On the following morning he was more apathetic and feverish. On the evening of May 17 spots began to appear on the ankles, feet, hands and legs, spreading to the body and lastly to the face after 24 hours. The child became delirious in the afternoon of May 19 and continued so throughout the illness. When seen by Dr. Parsons at 1 P. M., May 20, a petechial eruption covered the entire body and face, including the scalp, palms of the hands and the soles of the feet. Pulse was 132; respirations 72; axillary temperature 104-5. The child was drowsy, though delirious, during short periods of sleep. He picked at the bed clothes and his tongue. The tongue was red at tip and edges with heavy white coat in the middle. Eyes were suffused; photophobia present. Pupils responded to light and accommodation. Bowels were tympanitic. Some tenderness on pressure along the spine, especially in dorsal region, though this may have been due in part to general soreness of muscles. Lungs showed small area of pneumonia. Patient was seen May 21 at 2:30 P. M. by Dr. Wilson. Respiration 48; pulse 120; axillary temperature 101; child restless and delirious, face flushed, lips parted, tongue covered with sordes. Patient presented the general facies of typhoid fever. Spine was not more sensitive to pressure than other portions of the body. Kernigs sign absent. There was no pneumonia. Rash was most marked on the limbs, especially on the dependent portions of the thighs (patient lying on back.) It consisted of minute petechial hemorrhages brownish red in center with light red margins. Child was seen the second time at 5 P. M. Respiration, pulse and temperature were the same as noted at 2:30 P. M. Child again seen May 22 at 9 A. M.; respiration 56; pulse 140; temperature 104. Haemaglobin was 50 per cent red, blood counts showed 4,300,000; white count 12,000 at 1 P. M. May 22. Respirations were 50; pulse 120; temperature 103. Patient was not seen again by a physician but his condition did not change sufficiently to be observed by the parents until midnight May 25, when he began to grow rapidly worse and died at 5 A. M., May 26.

Autopsy No. 2.

Held by Drs. Wilson and Longeway at 1 P. M., May 26, 8 hours after death. Body was still slightly warm. Rigor mortis intense.

Body.—The skin over dependent portions of the back, thighs, etc., was dark purple. Over the arms and legs were purplish areas alternated with red and white, giving a marbled appearance. Abdomen and face were covered with small petechae brownish red in color. On the legs, thighs, arms and about the neck of the child were numerous small wounds said by the father to have been bites of wood ticks made just previous to the child's illness. Cultures, direct cover slip preparations and specimens for histological examinations were taken parallel to those collected from the skin in Autopsy No. 1. (See page ——.)

Pleura.—The pleura was not adherent.

Lungs.—The lungs were apparently normal. No pneumonia was present. Cultures, direct coverslip preparations and specimens for histological examinations were made parallel to those collected in Autopsy No. 1. (See page ——.)

Pericardium.—Pericardium was normal but contained an excess of fluid (not measured). Cultures and direct cover slip preparations were made from the pericardial fluid. The epicardium contained no hemorrhagic areas.

Heart.—The heart was normal in size, the muscles normal, or perhaps a trifle softened. Right side contained dark red blood. Left contracted and empty. Cultures, direct cover-slip preparations and pipettefuls of blood were collected from the right ventricle and specimens for histological examinations were taken from the wall of the left ventricle.

Liver.—The liver was noticeably enlarged; slightly paler in color than normal, of normal consistency and showed no congestion. Gall bladder and its contents appeared normal. Cultures, direct cover slip preparation and specimens for histological examinations were collected.

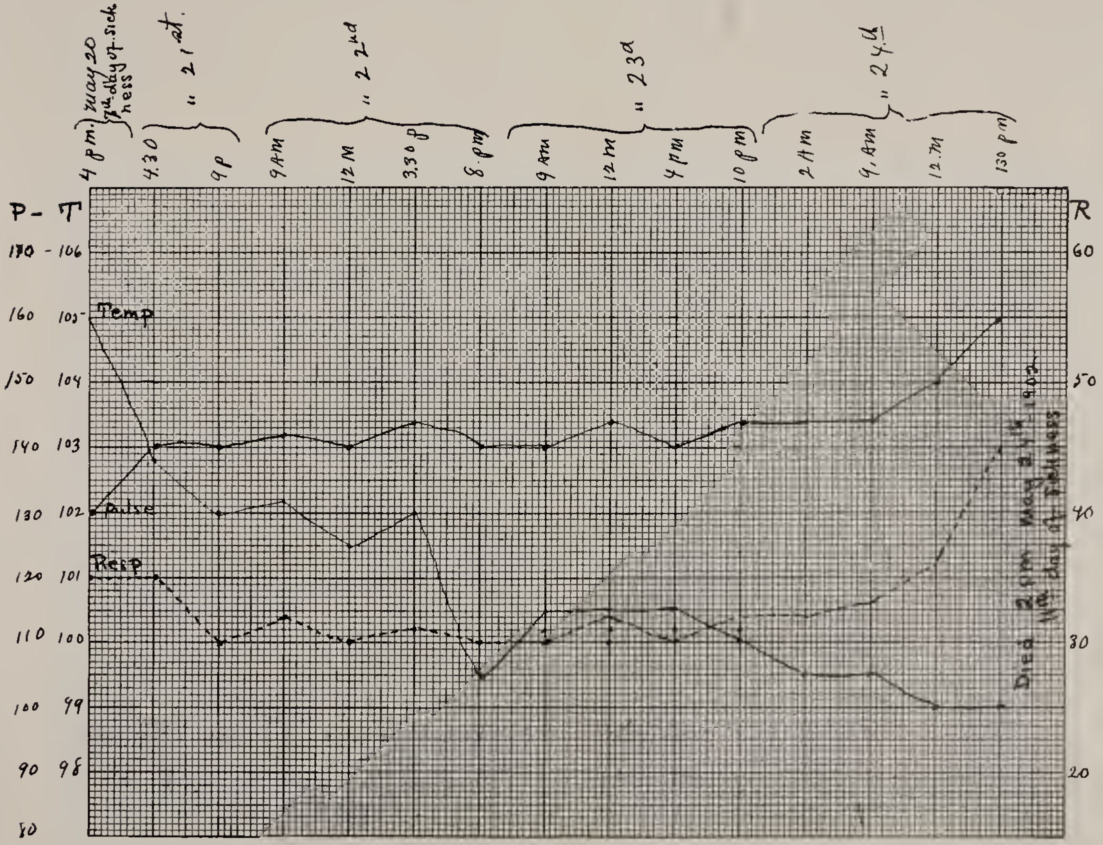
Spleen.—Spleen was enlarged (weight 9 oz.) after being wrapped in paper four hours. Capsule was stretched and thinned. On section the pulp was found to be very dark in color, soft and diffluent. Cultures, direct cover slip preparations and specimens for histological examinations were made parallel with those from the skin.

Stomach and Intestines.—Stomach and intestines were carefully examined. Nothing abnormal found except that the colon was distended with gas. None of the glands of the intestine were enlarged. Portion of the omentum covering the spleen was darkened and apparently disintegrating. A portion was removed and placed in varions fixtures for histological examinations. Two or three ecchymotis hermorrhages were present in the vental portion of the capsule over the left kidney. On section the cortex of both kidneys was found to be congested.

Bladder.—Bladder contained about 1-2 oz. of apparently normal urine.

Brain.—On opening the skull the meninges of the brain were found to be normal, except a slight congestion (hypostatic) in the vessels of the pia over the occipital pole. Brain substance was normal in color and consistency, exhibiting no congestion. There was no evidence of meningitis. The upper 6 inches of the medulla and spinal cord, enclosed in its membranes was removed through the foramen magnum. There was no inflamma-

Chart showing temperature, pulse and respiration of Mrs J.D. case No 30 (No 84 table 4, map.



tion in the meninges of the plura or in the substance of the organ. Cover slips, cultures, and specimens for histological examinations were made from the substance of the meninges, brain and spinal cord.

Case No. 3. (No. 89 on Table and Map.)

Patient of Dr. H. Brethour of Hamilton, Montana. Mrs. J. D. age 34, born in Nebraska, married 19 years. Mother of three children; two dead; youngest living, aged 12 years. Patient had typhoid fever in Nebraska 12 years ago. Had malaria from youth until about 8 years ago. Removed from Nebraska to Oklahoma 6 years ago, thence came to Grantsdale, Mont., in July, 1901. January 20, 1902, removed from Grantsdale to a point 1-2 mile from present residence and from thence in the latter part of February to present location, which is 1-2 mile south and 3 1-2 miles west of Hamilton. House is situated directly at the base of the mountains, three miles from the river, and about 50 yards from a small stream—Barley creek—from which water for domestic purposes is obtained. No other settlers are on the stream above D's house. House is small, built of logs, but dry and has a cellar underneath. Ground about is well drained. Location is particularly sunny.

Mrs. D. had been in perfect health all winter and had not been subjected to any extra exertion prior to her illness, neither had she been exposed to wet or cold. On the evening of May 12 she took a slight chill and the morning afterward remarked she "felt as though she had an ague chill," complained of bad taste in the mouth, and was "dauncy" all day but did her work. On the evening of the same day—May 13—she had a "dumb chill." She then took two "medium sized" quinine capsules. It seemed "to go to her head." On the evening of the following day, May 14, she had another chill. She now complained of an aching in the legs and arms like rheumatism. This grew worse though did not become so severe as to prevent her walking about until May 20. May 15 she became markedly deaf—a symptom prescribed to the quinine taken May 13. Distinct spots began to appear on the evening of May 14, coming first on the legs and arms and slowly spreading over the body, which was covered in about four days. Patient was first seen by a physician—Dr. Brethour—on May 20, at 4 P. M. At this time patient exhibited great lassitude, intense thirst and marked weakness of capillary circulation. Patient was seen on the evening of May 23 by Drs.

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Wilson, Brethour and Buckley. At this time she was very restless and in much misery with nausea. Patient again examined 10 A. M., May 25. Conditions of nausea continued. Breathing was rapid and somewhat labored. Mind was perfectly clear as it had been from the beginning and as it continued until a few hours before death. At this time the eruption had spread and coalesced until purpuric areas several inches in diameter were present over various parts of the body as the patient lay in bed. The legs and arms were found to be covered with bites of ticks which had been particularly numerous about patient's residence.

Blood counts showed 4,200,000 red blood cells and 14,000 white cells. Haemaglobin 60 per cent.

Patient was seen again on the evening of May 23 and again on the morning of the 24th at 5 A. M. At this time she was breathing very deeply and was aroused with difficulty, though when aroused appeared to be perfectly rational. Kernigs sign, opisthotonos, and all other symptoms of meningeal involvement (except possibly the deafness) were entirely absent on May 23 and had not been noticed at any time during the disease. About noon of May 24 the patient became gradually unconscious, her respiration more rapid, pulse weaker and weaker, until at 2 P. M. she died.

The following chart gives the temperature, pulse and respiration from the time patient first came under the care of a physician.

Autopsy No. 1.

Held May 24 at 9 P. M., seven hours after death by Dr. Wilson, assisted by Drs. Longeway, Brethour, Buckley, McGrath, Howard and Conghenhour.

Appearance of Body.

Skin.—Body was that of a well nourished woman about 5 feet 5 inches in height and weighing about 130 pounds. The skin over all dependent portions of the body was markedly purpuric, over other portions of the body the skin showed petechial spots, dull brownish in color. Over legs and arms and about neck were numerous small wounds said to be from tick bites. Body was still warm. Rigor mortis intense. Service of skin over dependent portion of thigh was sterilized by burning, incised with sterilized knife and about one cubic centimeter of tissue removed through the incision, but from under area not cauterized. This was used for making plain broth, plain agar and Loffler's blood serum cultures; also for direct cover slip preparations. A portion of the skin from another similar area was removed, divided and placed in 95 per cent alcohol, 10 per cent formaldehyde and zenkers fluid.

Pleural.—No Pleural adhesions were present.

Lungs.—Both lungs appeared normal except slight hypostasis on both sides. Cultures, direct cover slip preparations, and pieces of tissue for histological examination, were collected parallel with those from the skin.

Pericardium was normal. Cultures and direct cover slip preparations were made from the pericardial fluid.

Heart.—There were no ecchymotic areas over the surface of the heart. The heart was somewhat dilated and its tissues much softened and pale. Right side was filled with dark fluid blood; left side empty and contracted. Cultures, direct cover slip preparations and sterile pipettefuls of blood were removed from the right ventricle. Tissues for histological examination parallel with those collected from the skin were made from the walls of the left ventricle.

Liver.—There were no liver adhesions. The organ was somewhat enlarged, pale, of normal consistency and not congested. Cultures, direct cover slip preparations and tissues for histological examinations were collected parallel with those from the skin.

Spleen.—The spleen was much enlarged (weighing 25 oz. 12 hours later, the organ, in the meantime, having been wrapped in paper.) The capsule was stretched and thinned. On incision the contents were found to be very soft and diffluent. Cultures, direct cover slip preparations and preparations for histological examinations parallel with those collected from the skin were made also from the spleen.

Stomach.—The stomach and the entire length of the intestine were carefully examined both externally and internally, and nothing abnormal found, except a slight congestion in the upper portion of the jejunum (probably hypostatic). The mesentery glands were not enlarged. The portion of the omentum overlying the spleen appeared dark, congested and softened. A portion of this was removed and preserved in the three fixtures noted above.

Kidneys.—A small ecchymotic area was present immediately underneath the capsule on the anterior ventricle surface of the right kidney. The capsule stripped freely. On section the cortex of the kidney appeared slightly congested. The left kidney showed no ecchymotic areas and was otherwise like the right. Cultures, direct cover slip preparations and tissues for histological examinations parallel with those collected from the skin were made.

Bladder.—The bladder contained about 3 oz. of urine. Both the organ and contents appeared normal. Nothing abnormal was present about the uterus. Examination of the central nervous system was not permitted.

Case No. 4. (No. 91 on Table and Map.)

Patient of Dr. J. T. Brice, Stevensville, Mont. O. G., male, age 22. Farmer residing five miles southwest of Florence. Taken sick May 18, 1902, with pains in head, back, upper and lower limbs, and soreness of muscles generally. When first seen by physician temperature was 102.4 degrees F., pulse 108 and respirations 24. Pulse continued rapid, 105 to 120, and temperature 102 to 103 until last day before death, when the pulse rate became more rapid—150—while the temperature dropped to normal. Death occurred on the eighth day of the disease.

Autopsy No. 3.

Held at 11.40 P. M., May 26, 10 hours, 40 minutes after death, by Dr. Wilson, assisted by Drs. Brice, Longeway and Buckley. Body of man about 5 feet 10 inches in height, weight 140 pounds.

Skin.—Skin over all dependent portions of body markedly purpuric; over face, chest, abdomen, ventral portions of thighs, legs and feet covered with petechial spots brownish red in color. On right leg several small wounds, said by companion to have been caused by tick bites. Rigor mortis intense. Body still slightly warm. Cultures, cover slip preparations and specimens for histological examinations were made parallel to those collected from skin in Autopsy No. 1 (see above).

Ribs somewhat displaced by old scoliosis.

Pleura not adherent.

Lungs.—Lungs apparently normal, except slight hypostatic congestion on both sides. Cultures, direct cover slip preparations, and specimens for histological examinations made.

Pericardium.—Percardium normal, except somewhat distended with fluid apparently in increased amount (not measured).

Cultures and direct cover slip preparations made from the pericardial fluid. One small ecchymotic area in right ventricle.

Heart.—Right ventricle of heart was filled with blood; the left empty. Cultures and direct cover slip preparations were made from right ventricle; specimens for histological examinations were made from left ventricle. The heart muscle was apparently somewhat softened.

Liver.—The liver was appreciably enlarged. Pale in color, of normal consistency and not congested.

Spleen.—Spleen was much enlarged in size (weight 22 oz. after being wrapped 8 hours in filter paper.) Capsule was stretched and thinned. On incision pulp was found to be dark colored, very soft and diffluent. Cultures, direct cover slip and specimens for histological examination were made.

Stomach and Intestines.—Stomach and intestines carefully examined. Nothing abnormal found. Glands were not enlarged. Omentum covering spleen was pale and apparently degenerated. Portion was secured for histological examination.

Kidneys.—Several minute hemorrhagic spots were present in the capsule over the ventral surface of each kidney. On section a cortex of each kidney appeared to be congested, otherwise normal. Cultures, direct cover slips preparations, specimen for histological examinations were made.

Bladder.—Bladder contained about 2 oz. of urine and of normal color.

Brain.—On removing the skull the meninges over the occipital were found congested (hypostatic) but otherwise normal. Brain substance normal in color and consistency. Upper 5 inches of medulla, spinal cord and membrane was removed via the foramen magnum. There was no inflammation or marked congestion in either meninges. From the meninges, brain and spinal substances cultures, direct cover slip preparations were made, and specimens for histological examination preserved.

Case No. 5. (No. 3 on Table and Map.)

Patient of Dr. J. T. Brice, Stevensville, Mont. J. A. P. Male, age 23. Farm laborer. Patient taken sick May 20, 1902, with dullness, headache, pains in back and soreness of muscles. On the third day purpura appeared on all parts of the body beginning on the extremities. The spots were small but sharply defined. At this time the patient was nervous and much excited, but not delirious. He was seen but once by a physician. Death occurred on the seventh day.

Autopsy No. 4.

Held at 10 P. M., May 27, 10 1-2 hours after death, by Drs. Wilson and Spottswood. Height 6 feet 6 1-2 inches. Weight 165 pounds.

Body.—Over dependent portions of the back and thighs the skin was markedly purpuric; over other portions the skin was covered with brownish red petechia. These were almost absent over the abdomen. On calves of legs and on right side of neck were a few small wounds said by employer to have probably been made by ticks. Rigor mortis intense. Body slightly warm.

Pleura.—Pleura intensely adherent over entire surface of both lungs, adhesions very thick and fibrous (history of pleurisy several years before).

Lungs and Lung Tissues.—Lung tissue fully crepitant, slight hypostatic congestion on both sides. Cultures, direct cover slip preparations and specimens for histological examinations collected.

Pericordium and Pericardial Fluid.—Pericordium normal. Pericardial fluid not increased in amount. Cultures, direct cover slip preparations made. Epicardium on ventral surface of left vertricle showed several small hemorrhagic areas.

Heart.—Right heart filled with blood apparently darker in color than normal. Small clot in left heart. Heart muscles apparently softened. Cultures and cover slips preparations collected from blood of right heart. Specimens from left heart preserved for histological examinations.

Liver.—Liver enlarged though not markedly so; quite pale, normal in consistency.

Gall.—Gall bladder extended with fluid bile.

Spleen.—Spleen adherent to gut enlarged (weight 17 oz.) 12 hours later, in the meantime being wrapped in paper. On section pulp was found to be very dark in color, soft and diffluent. Capsule streached and thinned.

Stomach.—Stomach was congested over dorsal portion (hypostatic)? Intestine normal throughout entire length. Intestinal and mesenteric glands normal. Mesenteric vessels congested. Omentum over spleen not differing from omentum elsewhere.

Cultures, direct cover slip preparations and specimens for histological examinations were made.

Kidneys.—Several small sub-capillary hemorrhages in both kidneys. On section cortex of each found slightly congested. Cultures, direct cover slip preparations and specimens for histological examination were collected.

Bladder.—Ventral wall of the bladder was congested. Bladder contained about 1 oz. of urine, normal in color.

Permission to examine central nervous system was not obtainable.

Case No. 6. (No. 97 on Table and Map.)

Patient of Drs. Burton and Glasgow of Missoula. Mrs. W. Age 66 years. Wife of rancher one mile northwest of Victor. Mother of two children. Had been in especially good health during the last two years. May 19 drove to Hamilton and back —journey of 20 miles. On May 21 or 22 received a severe tick bite in the left popliteal space, swelling involving the whole space ensued and a small point of suppuration followed at the site of the bite. Other than this she was perfectly well until May 23, when she had a chill. This was followed by a rise in temperature, listlessness and severe aching and soreness in the muscles and bones. May 25, spots began to appear first about the ankles and wrists and then rapidly covered the body. The mind, previously clear, now became clouded. There was no retraction of the head. The fever rose quite high. During the night of May 27 patient was for a time delirious but the mind cleared up the following morning. During the forenoon of May 28 she was apparently very much improved and was thought by relatives to be out of danger. About noon May 28 she began to sink rapidly and died at 6 P. M. of the same day. (Temperature, chart, etc., not obtainable.)

Autopsy No. 5.

Held at 6 P. M. on May 29, 24 hours after death by Dr. Chowning.

Body well nourished. Weight about 130 pounds. Skin covered with areas of discoloration, particularly on the dependent parts. Quite marked on chest and abdomen, the legs and arms. These areas of discoloration were continuous, in places giving a homogeneous reddish purple appearance over portions of the abdomen, chest and part of the legs, arms and ankles, spots from

5 millimeters to 1 1-2 centimeters in diameter were present. In the left popliteal space an ulcer about the size of a dime was present. This ulcer was more or less dried, but peruim was found on pressure to be present around the ulcer for a space of about 2 centimeters. The tissue was deeply colored and swollen. An incision extending from lower end of sterum to about midway between umbilicus and pubis was made.

Omentum was somewhat discolored, showing post-mortem degeneration.

Pericardium.—Pericardium normal. No fluid in cavity.

Intestines.—Intestines slightly discolored and distended by gas.

Liver.—Liver rather swollen, cuts easily, color apparently normal.

Kidneys.—Left kidney about normal size. Capsule adherent and slightly hemorrhagic. On section the organ showed slightly hemorrhagic areas. Cortex normal in thickness. Right kidney small. Capsule strips easily, feotal lobulation present. On section cortex thin and dark and hemorrhagic areas over whole surface, extending down to pelvis.

Heart.—Heart (reached by incision through the diaphragm) normal in size. Hemorrhagic areas over both ventricles. Organ soft. On section valves found normal.

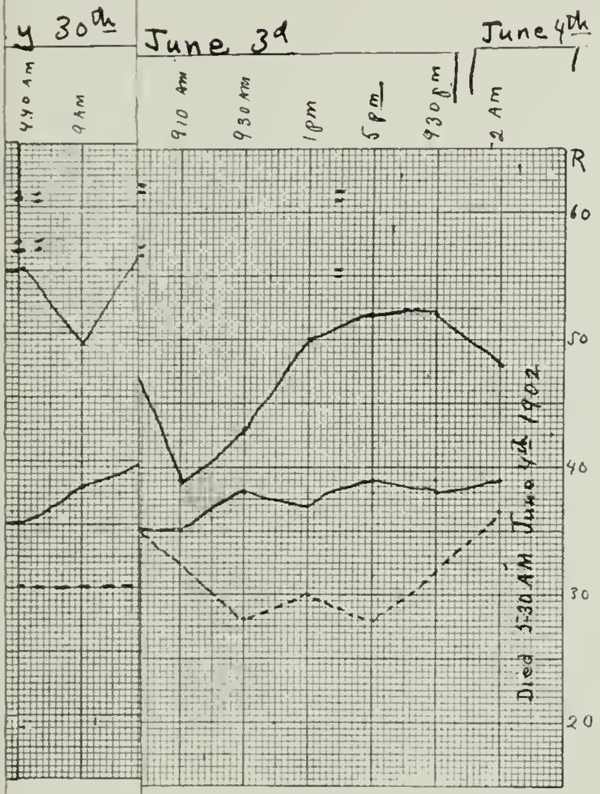
Lungs.—No examination permitted.

Spleen.—Spleen very dark, about three times normal size (not weighed). Organ soft. Capsule stripped easily. On section the spleen substance found to be in an almost fluid condition. Deep red. Cultures, and direct cover slip preparations and specimens for histological examination, and agar, broth and serum cultures were made from the left kidney, liver, heart and spleen.

Case No. 7. (No. 94 on Table and Map.)

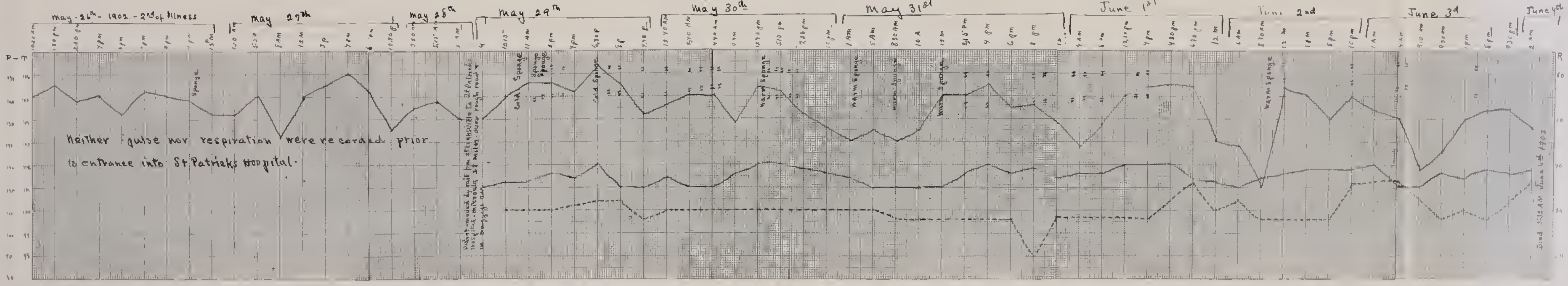
Patient of Drs. Brice of Stevensville, Mont., and Buckley of Missoula, Mont. A. R. Female, Age 5 years. Resident in town of Victor, near depot. Parents well to do. Child had been carefully guarded and had for over a year before her illness drunk absolutely no water except that from the well at her home. Previous health had been good.

May 23 her father and his brother returning from Mr. R.'s ranch near the base of the mountains, west of Stevensville, brought home, on their clothing, many ticks. Patient was severely bitten on the back of neck by one of these May 23 or 24.



doses to the point of cinchanism after the 6th day of illness. Strychnia in 1-100 grain doses was given every 3 to 6 hours. Sponge baths, cold or warm, seemed to have practically no ef-

Chart of A.R. case No 7. (No 94. table and map)



erely bitten on the back of neck by one of these May 23 or 24. On the evening of May 25 she appeared listless and feverish. On the morning of May 26 she was seen by Dr. Brice of Stevensville, at which time her temperature was 104, pulse 120. Spots had already developed about the ankles, legs and arms. Patient was seen May 27 at 9 A. M. by Drs. Wilson and Spottswood. Temperature at this time 104, pulse 140, and respirations 28. Spots were well marked over the entire body, being most numerous on the dependent portions, especially the thighs. The child was feeling a little weak, but complained because she was not allowed to go out and play. Her mind was perfectly clear. Pupils reacted normally to light and accommodation. Kernigs sign was absent and there was no retraction of the head or other symptoms of meningeal involvement. The tongue was somewhat coated but the appetite was good. Blood counts showed 4,500,000 red and 12,000 white cells. Haemaglobin 62 per cent. Freshly drawn blood was examined with the 1-12 objective and in two red blood cells were found bodies resembling malarial organisms about 3 microns in diameter and exhibiting slow amoeboid movements. At this observation no warm stage was at hand but the ordinary stage of the microscope and condenser were warmed over an alchohol lamp and the examination made in a warm room. The organisms were kept under observation for about 15 minutes.

Patient was brought to St. Patrick's Hospital, Missoula, Montana, May 27, and placed in charge of Dr. Buckley.

Another examination of the blood was made May 29, at 9 A. M. At this time a warm stage was used and the observations continued for 45 minutes. Many red cells—2 or 3 in the field of the 1-12 objective—contained small refractile bodies—usually 2 to the cell. They were from 1 to 1 1-2 microns in diameter and ovoidal in shape. Certain of these were seen to slowly change their positions within the cell. In addition, in two or three red cells, were found larger bodies about 2 microns in diameter which exhibited a slow amoeboid movements.

Vomiting began on the 6th day of illness and continued at intervals until death. Patient was not delirious until immediately before death. She was given quinine in 1 and 2 grain doses to the point of cinchanism after the 6th day of illness. Strychnia in 1-100 grain doses was given every 3 to 6 hours. Sponge baths, cold or warm, seemed to have practically no ef-

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Autopsy No. 6.

Held June 4, 1902, 8 A. M., two and one-half hours after death, by Drs. Chowning, Wilson and Buckley.

Skin.—Body well nourished. Face and limbs swollen, especially the former. Entire body covered by splotched areas, reddish or slightly tinged with purple color. No scars present. On back of neck there was a small ulcer due to tick bite. Incision made in lower end of sternum to the pubes. Abdominal wall contained much fat.

Pericardium.—Pericardium normal.

Omentum.—Omentum slightly hemorrhagic.

Lungs.—Examination not allowed.

Heart.—Heart (reached by an incision through the diaphragm) organ normal in size. Hemorrhagic areas seen over both ventricles. On section endocardium apparently normal.

Spleen.—Spleen (weight 9 oz.) organ dark and flabby; capsule strips easily. On section contents are seen to be of a dark yellowish red color, decidedly diffluent.

Liver.—Liver normal in size, color and general markings. On section the organ was quite light in color.

Gall.—Gall bladder contains 1 1-2 oz. of fluid of dark yellow color. Gall ducts are patulous.

Stomach.—No examination allowed.

Intestines.—Intestines normal in color and general appearance but distended with gas. No incision made.

Kidney.—Left kidney normal in size. Capsule strips quite easily. Hemorrhagic area seen near the upper pole and anterior surface. On section cortex normal in thickness with hemorrhagic areas seen over the cut surface of cortex.

Pelvis normal.

Urine normal.

Right kidney apparently normal, but on section similar hemorrhagic areas are seen though to a less marked extent.

Further examination of body not permitted.

Cultures, direct cover slip preparations and specimens for histological examination parallel with those in Autopsy No. 1, were collected. A pipetteful of heart's blood was used for immediate inoculation of a rabbit and a pigeon. An emulsion of spleen pulp in sterile water was used for a similar inoculation of another rabbit and pigeon.

Case No. 8. (No. 98 of Table and Map.)

Male. Age 38. Occupation, timber cruiser. The data at hand in this case are too incomplete to give a detailed report. At no time, however, was the patient in an apparently serious condition. He was employed by the same firm, in the same business and locality as case No. 1, our series, (No. 109 table and map), having taken position left vacant by the death of Case No. 1. He began work in the mountains about May 15th and was taken sick June 1st, while at work, following exposure to wet and cold. He was first seen by Dr. Gwinn June 3rd, on which day he was removed to his home in Missoula, who reported that at that time the spots were present.

On the afternoon of June 3 patient was visited by Drs. Gwinn and Chowning and gave the following history of the onset.

He was first taken with a chill and fever, accompanied by headache, aching of limbs and back, nausea and constipation. He said that he had been bitten many times by wood ticks while at work and on examination evidence of the truth of his statement was visible in the wounds over his body.

Purpuric spots were present over wrists and ankles with a few here and there over the trunk. Patient still complained of nausea, headache and constipation. His temperature by mouth was 102.5 F. Specimens of blood taken at this visit were stained and examined, showing presence of a parasite. June 5th a microscope was taken to bedside and fresh specimens examined. The parasite was again seen in fairly large numbers, drawings of which showing various stages of amoeboid movement were made at this time.

June 6th the patient was visited by Drs. Gwinn, Chowning and Wilson and fresh blood specimen again examined and the parasite again studied. The temperature of the patient at this time was 101.5. He was feeling somewhat better—was out of bed and dressed. He was not seen again by the writers, but Dr. Gwinn reports the case as recovered.

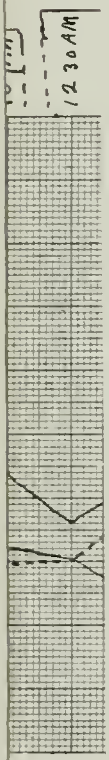
Case No. 9. (No. 95 of Table and Map.)

J. O. Male. Age 2 years. Patient of Dr. J. T. Brice, Stevensville. Child had not been away from immediate vicinity of home for several weeks before illness. Home in small clearing in timber on lower foothills. Had been bitten by ticks recently as shown by wounds. Symptoms of onset obscure; temperature 104; pulse 140; respirations 42; convulsions; vomiting; diarrhoea. Purpuric spots appeared on the third day, first on the wrists and ankles and rapidly spreading to whole of body. The patient was seen on the 4th day of illness by Drs. Wilson and Brice and fresh blood preparations examined on the warm stage. A few haematozoa showing amoeboid movements were observed in the red blood cells. Cover slip preparations collected at this time and others collected later when stained showed a few haemetozoa. The patient was given frequently 1 grain doses of quinine. From this on the disease ran its usual course, the temperature ranging from 101 to 104 with rapid pulse and respiration, until about the 12th day, when the temperature dropped, pulse and respiration became less rapid and the child appeared much brighter and everything pointed to recovery. This continued for 4 or 5 days when pneumonia developed and the patient died on the 18th day. No autopsy was permitted.

Case No. 10. (No. 96 on Table and Map.)

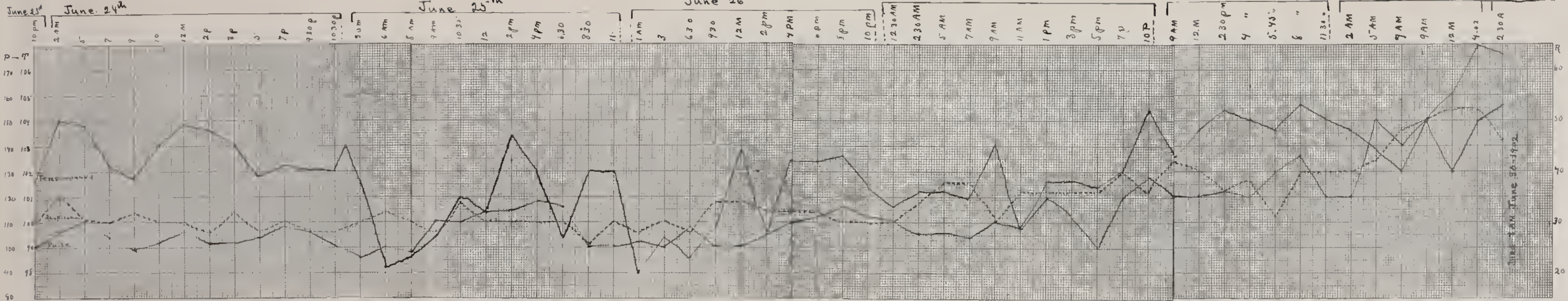
Patient of Dr. J. Brice of Stevensville. D. McD. Male. Age 34 years. Lumberman. Patient was bitten on scrotum by tick June 14. Wound became sore and swollen. On June 17 patient complained of headache, pains in back and loins, soreness of muscles, etc. He was seen first by Dr. Brice, 33 hours after onset of symptoms. At this time his temperature was 103, pulse 90, respirations 24. His symptoms were as at onset but intensified. On the third day of his illness purpuric spots appeared on his wrists, ankles and ear lobes. These spread in 24 hours to most of the body except face and abdomen. On June 23, 6th day of illness, he was seen by Drs. Westbrook, Wilson, Brice and Buckley, and blood collected and examined in fresh and in stained preparations. The fresh preparation showed the greatest number of haematozoa as yet met with in circulating blood. Plate No. —— is from a sketch from one of the preparations.

On June 24 and 25 other fresh blood specimens were collected and examined by the above mentioned physicians and also by Drs. Cobb and Chowning. The haematozoa were readily demonstrable but much less numerous than on the first examination. Stained preparations of blood collected at these times show the organisms in a relatively large number of red blood cells. Urine collected at this time showed the presence of



malaise. This is followed by a well-marked chill. The chill is usually most severe at the beginning of the attack and recurs at irregular intervals though with decreasing severity. At the

Chart D. McD case no 10 (table and map no 96)
showing temperature, pulse and respiration curves



blood cells. Urine collected at this time showed the presence of a small amount of albumen with casts.

The patient's temperature fluctuated considerably during the next few days, but gradually grew higher while the pulse became much more rapid until death occurred on the 13th day of illness. No autopsy was permitted.

Local Infection.

We report here the findings in a case not listed in our series or in Table I, but which is nevertheless interesting in that it seems to show the possibility of a local infection by a haematazoan through the bite of an arachnid.

W. G., a locomotive engineer on the N. P. R. R., entered the R. R. hospital at Missoula and was examined by Drs. Buckley and Spottswood and the writers.

Patient complained of headache and severe soreness in the right pectoral region and gave the following history: While on his run on the Couer d'Alene branch he was bitten by a tick, June 16, 1902, below the right nipple. On examination a wound was found about 1 1-2 inches below right nipple. This wound was from 5 to 8 millimeters in diameter and covered by a scab. The size of the wound had probably increased by scratching on account of itching. Immediately surrounding the wound was an area about 7 centimeters in diameter which was decidedly purpuric, and surrounding this a zone of foded discoloration. The whole was very much swollen and hard. No pus found in the wound.

Blood specimens were taken from the purpuric area immediately around the wound and stained specimen examined. Many red cells were found to contain haematozoa apparently identical in size, form and staining qualities with those found in the recognized cases of "spotted fever."

The wound was dressed in wet bichloride of mercury dressings and the patient was dismissed from hospital in about one week after entrance, apparently recovered.

The following general summary may be given of the symptoms:

Onset.—Many of the cases are preceded by a short period of malaise. This is followed by a well-marked chill. The chill is usually most severe at the beginning of the attack and recurs at irregular intervals though with decreasing severity. At the demonstrable but much less numerous than on the first examination. Stained preparations of blood collected at these times show the organisms in a relatively large number of red blood cells. Urine collected at this time showed the presence of a small amount of albumen with casts.

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The wound was dressed in wet bichloride of mercury dressings and the patient was dismissed from hospital in about one week after entrance, apparently recovered.

The following general summary may be given of the symptoms:

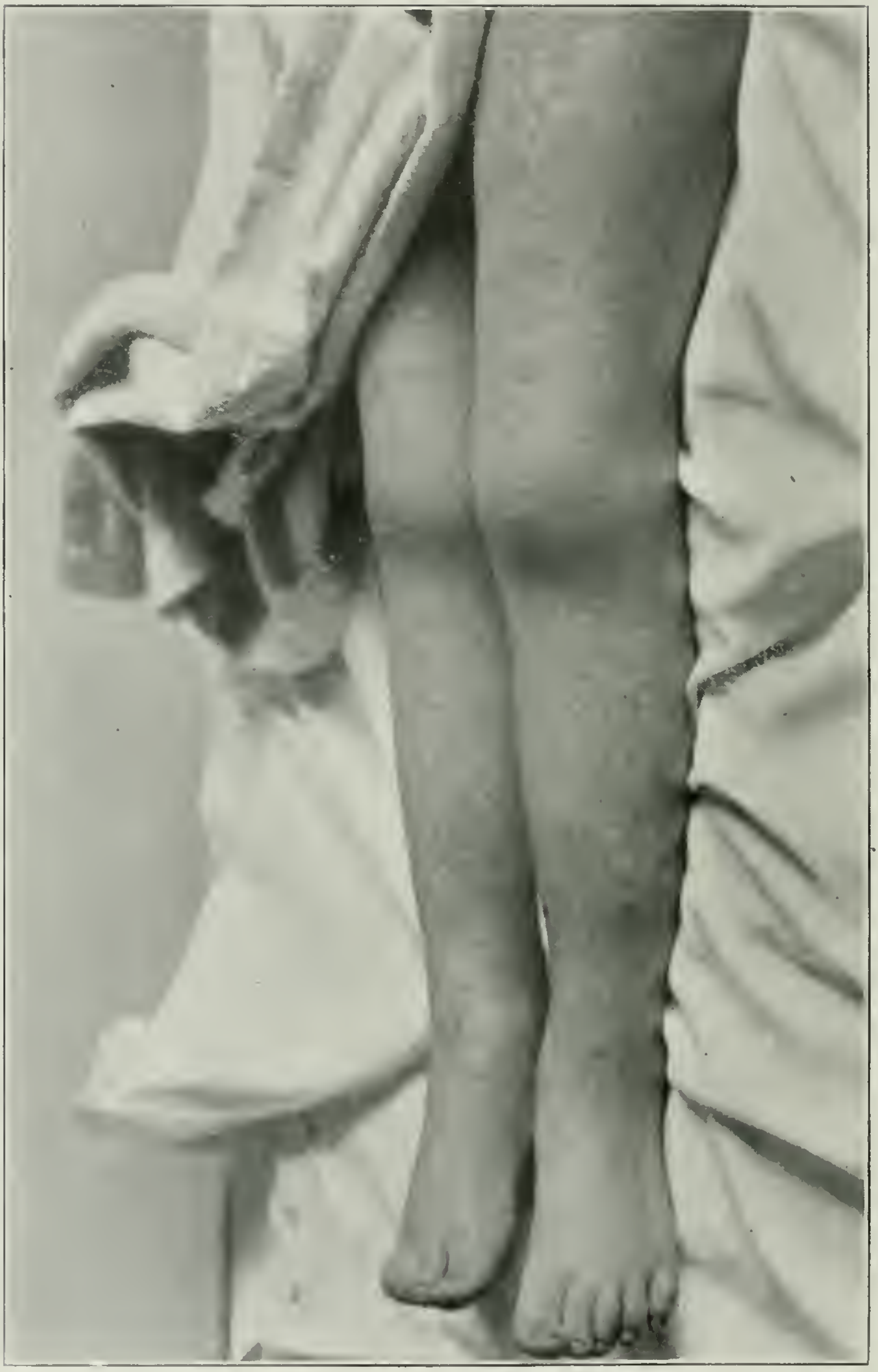
Onset.—Many of the cases are preceded by a short period of malaise. This is followed by a well-marked chill. The chill is usually most severe at the beginning of the attack and recurs at irregular intervals though with decreasing severity. At the onset there is a severe aching in the bones and muscles with pains in the back and joints. The patient is usually very weak and headache may be severe. Constipation at this period is usually present. There is considerable restlessness. A bronchial cough is frequently present. The urine is usually small in amount and highly colored; albumen is sometimes present. The skin is dry and the tongue, even at the onset, is thickly coated. The coat at first white becomes brownish as the fever increases while the tongue becomes dry and cracked. Sordes appear early and may be quite pronounced. Indeed, the whole facies in these respects is very like typhoid.

Temperature.—After the initial chill, fever rapidly develops, and may reach 103 to 104 F. on the second day. It gradually increases and reaches its maximum in from five to seven days, when it may register from 105 to 107 F. 2. Usually a slight evening increase and morning decrease is noted. The temperature occasionally becomes normal or subnormal eighteen to twenty-four hours before death. Where recovery occurs it usually is by lysis, much as in typhoid. The diminution of the fever begins about the end of the second week and reaches normal about two to four weeks later.

The following chart of case No. 80 is of interest in showing the progress of convalesence in a case which for the first two weeks was of a grave type:

Skin.—The eruption usually begins from the second to fifth day after the chill. Thus in the 114 cases reported in Table I the eruption appeared on 2nd day in 5 cases, 3rd day in 61 cases, 4th day in 21 cases, 5th day in 7 cases, 6th day in 2 cases, 7th day in 2 cases, 8th day in 2 cases (both doubtful), 9th day in 2 cases, and unknown dates in 12 cases, making a total of 114 cases.

It appears first about the wrist and ankles or back. It then extends over the entire body—the abdomen usually being involved last. Sometimes it spreads very rapidly, the entire surface of the body being covered in twelve hours. More usually, however, one or two days pass before it reaches the maximum. The scalp, palms of the hands and soles of the feet are frequently covered with rash. Occasionally, though perhaps rarely, purplish spots are found on the mucous membrane of the inside of the cheeks. The macules are at first rose colored and consist of circular spots, varying in size from one to five milli-



meters in diameter. They are not elevated. At first they disappear on pressure, but quickly reappear. They are sometimes tender to the touch. This appearance ordinarily rapidly changes, the macules becoming permanent, assuming a dark blue or purplish color and increasing in size until by confluence a mottled or marbled appearance may be given to the skin, especially in the dependent portions.* In some cases the marbling covers the entire body. The color now no longer disappears on pressure.

In some cases the eruption at no time becomes confluent and only small brownish or purplish petechiae may be present, giving a speckled appearance which has been likened to that of a turkey's egg. This appearance is shown in the accompanying photograph from Case I.

The skin ordinarily shows some jaundice. This may also be quite marked in the conjunctivae, the vessels of which are injected from the onset. About the second week ordinarily the skin presents a glazed appearance. Desquamation begins about the third week and extends over the whole body, but is slight except over the most affected areas. The spots fade as the fever subsides, but may not entirely disappear for weeks or months, after convalescence is established. In some cases the skin becomes gangrenous over considerable areas, as on the elbows, fingers, toes, lobes of the ears, scrotum, etc.

There is a peculiar ashy paleness present, more readily observed in children and women, a few days before death.

Nervous System.—Aside from the headache at the beginning, many patients show no nervous symptoms until just prior to death. A low muttering delirium as in typhoid fever is present in some severe cases, the patient being but partly rational. In the severe stages, picking at mouth, ears, bedclothing, etc., is present. Except at the outset, the disease is remarkable for its freedom from pain. The pupils react normally to light and accommodation. There is no opisthotonos. Kernig's sign is absent.

Circulatory System.—The pulse at the onset is usually full and strong, but gradually becomes more and more rapid, while it loses in volume and strength, very much as in diphtheria. In fatal cases in adults it may reach 150 per minute some days before death. The rapidity of the pulse is sometimes out of all proportion to the temperature, as may be also the respiration. The red blood count in five cases examined was 4,100,000, 4,200,000, 4,300,000, 4,500,000 and 4,600,000 respectively.* There was a slight increase of leucocytes—from 12,000 to 13,000—in the four cases examined.

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* Rectal temperature. The difference between rectal and axillary temperature is sometimes as much as 2 degrees.

Blood, when removed for examination, appears to be somewhat darker than normal, as well as somewhat less fluid. On exposure to the air the color brightens perceptibly. In five cases examined during various stages of the disease the hemoglobin was 50 to 60 per cent. One child (case No. 101, Table) of 12 years, examined two months after convalescense, showed Hb. 80 per cent. Freshly drawn blood from patients during their illness when examined with the 1-12 oil immersion objective shows parasites sparingly in the red blood cells. Blood was examined from three recovered cases, one of two months, one of one year and one of two years, without finding the haematozoa. The Widal reaction with B. Typhosus is not present. The spleen is uniformly enlarged and tender on palpation. In all severe cases more or less edema of the face and extremities is present. This may be marked and may appear as early as the third day of the disease.

Digestive Tract.—At the onset of the disease the appetite is usually good and food is well retained and assimilated. About the beginning of the second week nausea and vomiting develop and continue in fatal cases to the end. In some cases nausea is present from the onset. Constipation is usually present from the beginning. Abdominal tympanites usually appears one or two hours before death. The liver is somewhat, though not markedly enlarged. Pain on pressure is absent.

Urinary System.—The urine is reduced to about one-half its normal amount and is slightly above normal in color. A small amount of albumen has been found in each of the five cases examined. Hemoglobinuria is absent or very slight. Both granular and blood casts were present in specimens from each of the five cases.

Respiratory System.—The respiration rate sometimes reaches 60 per minute in the adult, though ordinarily it does not run above 36 per minute. Like the pulse rate it is frequently out of

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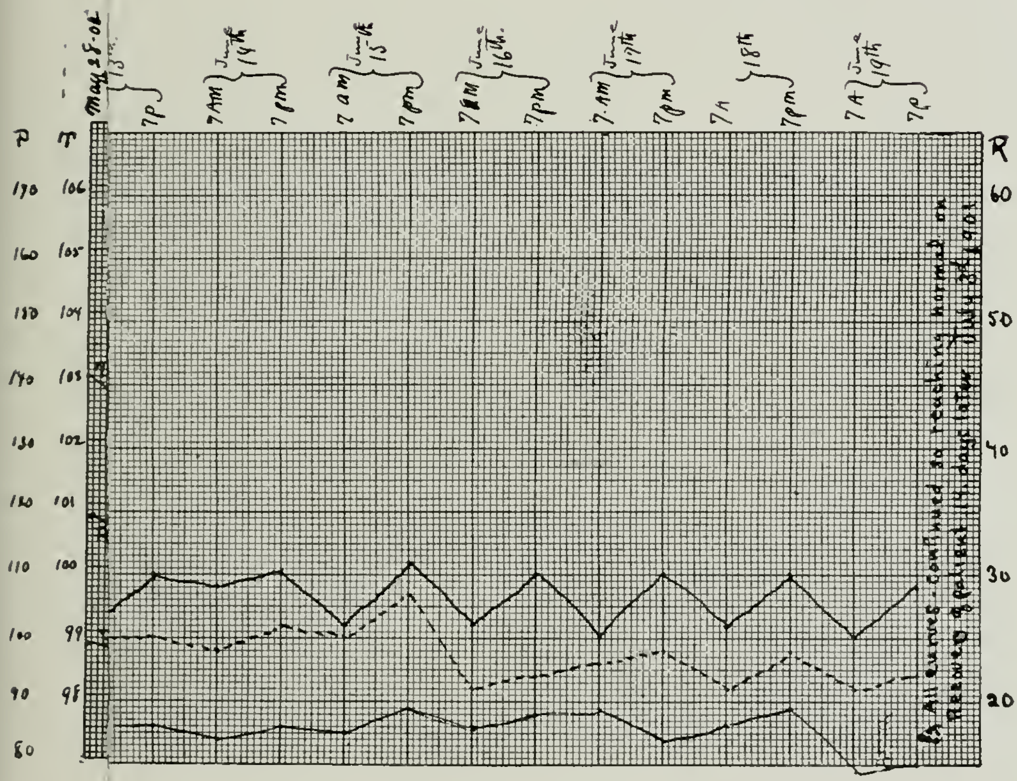
*It will be noted that these counts were made in an altitude of about ,500 feet, where the normal count is above rather than under 5,500,000.



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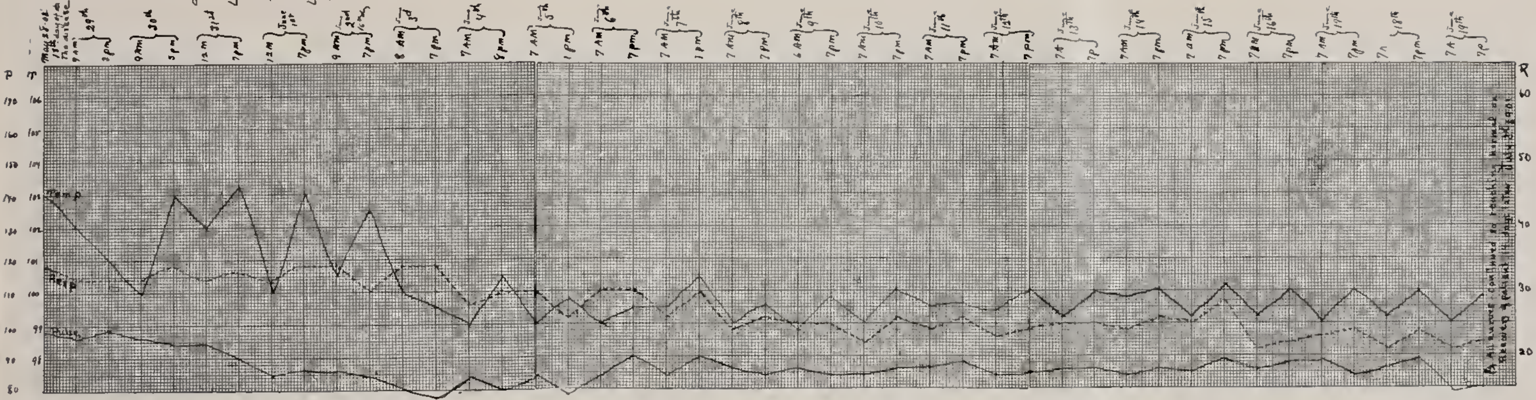
Death occurred on the 13th day in 3 cases.
Death occurred on the 14th day in 2 cases.
Death occurred on the 18th day in 1 case.

Chart. Showing Temp, Pulse and Resp. of Miss A.H (case no. 80 Table and map) -
Convalescence beginning on 16th day of disease



all proportion to the temperature. It is regular, but usually shallow. It may be labored and accompanied by rattling due to accumulation of mucus in the upper air passages, during the last day or two of life. Cheyne-Stokes respiration has not been observed. Hypostatic pneumonia sometimes develops. Lobar pneumonia occasionally occurs as a complication and usually hastens the end.

Complications.—The symptoms above noted are sometimes complicated by gangrene, hypostatic pneumonia, articular rheumatism, etc. Two physicians have noted epistaxis, but none has been present in any of the cases seen by the writers.

Prognosis.

In Montana cases of the mild type of the disease, which show no spots, are as yet too indefinitely differentiated to permit of their inclusion with those of the severe type which invariably develop the eruption. That such cases exist there can be no doubt. They are never fatal. On the other hand the cases which are marked by the eruption have a mortality of 70 to 80 per cent. Thus of the 114 cases reported in Table II, 81 died and 33 recovered, a mortality of 71 per cent. If there is omitted from the list the eight cases concerning the diagnosis of which some doubt was expressed (See page ——) and none of which were fatal, the 81 deaths out of a remaining total of 106 cases gives a mortality of 76 per cent.

Death usually occurs between 6th and 11th day, thus of the 81 fatal cases reported in Table I:

Table V.

Death occurred on the 3rd day in 1 case.
Death occurred on the 4th day in 1 case.
Death occurred on the 5th day in 3 cases.
Death occurred on the 6th day in 13 cases.
Death occurred on the 7th day in 12 cases.
Death occurred on the 8th day in 13 cases.
Death occurred on the 9th day in 8 cases.
Death occurred on the 10th day in 9 cases.
Death occurred on the 11th day in 9 cases.
Death occurred on the 12th day in 3 cases.
Death occurred on the 13th day in 3 cases.
Death occurred on the 14th day in 2 cases.
Death occurred on the 18th day in 1 case.

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Death occurred on the 12th day in 3 cases.
Death occurred on the 13th day in 3 cases.
Death occurred on the 14th day in 2 cases.
Death occurred on the 18th day in 1 case.

Death occurred on unnoted days in 3 cases.

Total, 81 cases. 64 between 6th and 11th days.

It is unsafe to prognosticate a favorable termination in a case because of mild initial symptoms since many such cases rapidly become fatal.

The prognosis of cases in Idaho is much more favorable. Dr. Maxey says of them: "The prognosis in "spotted fever" is, as a rule, very favorable if the patient is transferred to the lower valleys, where he can have home comforts and proper care. The disease appears to be more malignant in some localities than it is in others, and in one year more than in another."

Morbid Anatomy.

Six autopsies were made by the writers, in from three to twenty-four hours after death of the patient. Two of these were on adult males, two adult females, one four-year-old male and one five-year-old female. The microscopic lesions were very uniform throughout the series of cases and may be summarized as follows: Intense rigor mortis appeared early. The skin over all dependent portions of the body presented a marbled appearance. Over the nondependent portions it was covered with a petechial rash. In all cases small wounds of the skin due to tick bites were present.

The pleura was normal. The lungs showed hypostatic congestion. The pericardium was normal. The heart was normal in size except in one adult female, in which it was about two-thirds the normal volume. The epicardium usually contained a few petechial hemorrhages near the base of the left ventricle. The myocardium was softened. The endocardium showed no lesions. The right ventricle was filled ith dark fluid blood; the left was almost empty or contained only a small clot.

The spleen was enlarged, being from three to three and one-half times its normal weight. The capsule was distended and thinned. On section the tissue was found dark red and so soft as to be in most cases diffluent. The outlines of the Malpighian bodies were obliterated. The omentum covering the spleen was usually congested. In some instances the dependent portions of the stomach wall were hyperenic.

The intestines were normal—except slight hypostatic congestion in two cases—throughout their entire extent. Their glands

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*Five were made earlier than eleven hours after death.

were not enlarged nor abnormal in color. The liver was slightly enlarged, pale in color and of normal consistence.

In all cases one or both kidneys showed small subcapsular hemorrhages on the ventral surface. The capsule stripped readily. The cortex on section was congested. The bladder was normal and contained a small amount of urine slightly darker than normal. The uterus in the three females examined was apparently not affected.

The meninges of the brain and spinal cord showed a slight congestion, apparently hypostatic. There was no basilar (or other) meningitis. There was no increase of fluid in the ventricles of the brain. The tissues of the brain and spinal cord were normal in color and consistency.

Morbid Histology.

Portions of skin taken from purpuric areas, lung, heart muscle, spleen, omentum, liver, kidney, meninges, brain and spinal cord were each fixed in 95 per cent alcohol, 4 per cent. formaldehyd and Zenker's fluid. These have not yet been all examined from every case, but from the examinations already made (of tissues fixed in alcohol and Zenker's fluid) it may be stated that there is throughout a congestion of the capillaries. Many red blood cells in the congested capillaries contain parasites.

In the spleen, liver and kidney are numerous phagocytes, each containing from one to eight faintly outlined red blood cells, in nearly every one of which is a parasite. In the lungs many cells filled with pigment are found. The myocardium shows acute inflammation with segmentation. The spleen is engorged with red blood cells and leucocytes. The stroma is not increased in amount. In the liver fatty degeneration is very pronounced. The kidney shows an acute parenchymatous nephritis. Blood preparations taken from organs at autopsy as well as those from living patient show a marked poikilocytosis and anemia.

Etiology.

General Considerations —In studying the etiology of this disease the following facts have appeared to be of most significance:

1. The disease is definitely limited in locality, being sharply cut off from the eastern side of the valley by the Bitter Root river.

2. It is confined entirely to one season of the year, namely, from March to July.

3. It attacks alike patients of any age and either sex, though those whose occupation or pleasures take them to the foothills of mountains in springtime are most affected. (See Table III.)

4. All the symptoms and lesions indicate that the disease is due to a specific infection.

5. There is not even a suspicion of its ever having been transferred directly from one human being to another, except in one instance, in which an infant, (case No. 17), born while the mother was suffering from the disease, developed marked purpura on the second day after birth.

6. In no instance have two or more persons with the same food or water supply been simultaneously stricken with the disease.

7. There are no symptoms nor lesions which point to the digestive tract, respiratory or genito-urinary organs as the avenue of infection.

8. In all the cases examined by the writers there were small wounds of the skin, said to have been made by the bites of ticks. In nine of the cases this history was definite and positive. In one—a child (case No. 9)—no history of tick bites was obtained, though the skin wounds were present and ticks were numerous about the premises where the child had been playing. In three of the cases there was a history of a single severe bite, two, three and five days respectively before the onset of symptoms.

Bacteria.—In six cases direct coverslip preparations were made from the patient's blood during life. No bacteria were found in any of these. In five of these cases cultures on Loffler's blood serum, plain agar and in bouillon were made from the same source as the cover-slip preparations, after scrubbing the skin thoroughly with alcohol and permitting it to dry. Cultures from two of the cases showed a few cocci which were determined by subcultures to be Staphylococcus epidermidis albus.

At the six autopsies held—3, 7, 8, 10, 11 and 24 hours after death respectively—direct coverslip preparations were made from subcutaneous tissue, lung, pericardial fluid, heart's blood, spleen, liver and kidney. In but three autopsies was the central nervous system examined. Here coverslip preparations were made from the meninges and substance of the brain and spinal cord. The coverslip preparations were stained with eosin and Loffler's methylene blue, with eosin and Unna's alkaline methylene blue and by Gram's method. No bacteria were found in any of them except a few cocci in one skin preparation (in which case cultures showed the presence of Staphylococcus epidermidis albus), and in the preparations from the spleen, removed at the autopsy 24 hours after death, in which was present a large sporebearing bacillus. (See description below.)

At the autopsies cultures were made from all the sources noted under coverslip preparations—and in addition in three instances from the intestinal contents—on Loffler's blood-serum, nutrient agar and in bouillon. About 1 c.c. each of spleen pulp and heart's blood were also sown into flasks containing 250 c.c. each of bouillon. The spleen in five cases, after removal of coverslip preparations, cultures and small pieces for histologic examinations (and weighing) was wrapped in gauze, which had been wrung out of 1:1000 sublimate solution, and incubated for 24 hours. Direct coverslip preparations and cultures on Loffler's blood serum, agar and in bouillon, were then made from the incubated organ.

All cultures were examined microscopically and in coverslip preparations stained with Loffler's methylene blue. Great care was taken in all sowings to avoid contaminations, and in only two tubes did such occur, in each instance due to a single colony of mould. The cultures were grown only aerobically. The bacteria found were as follows:

1. Staphylococcus epidermidis albus from the skin in two cases.

2. Staphylococcus pyogenes aureus from the skin in one of the above cases.

3. Bacillus coli communis was sparingly present in cultures from the spleen in autopsy No. 4 (dead 10 1-2 hours). This bacillus was also present mixed with but a few other organisms in all cultures from the intestinal contents.

4. The spleen from autopsy No. 5 showed a bacillus 0.5 microns in thickness and 5 to 7 microns in length. The organism was square ended and contained spores. It stained deeply by methylene blue and also retained Gram's stain. There was no visible growth on or in any of the artificial media, though it had grown in the incubated spleen. The organism was presumably an anaerobic putrefactive bacillus.

No growth whatever was present in any cultures excepting those above noted. It will thus be seen that no bacteria were obtained in any cultures from any case which were of etiologic significance.

The following table gives in detail the results of examination of direct coverslip preparations and cultures collected at autopsies of which the preceding is a summary:

TABLE VI.—SHOWING RESULTS OF EXAMINATION OF DIRECT COVERSLIP PREPARATIONS AND CULTURES MADE AT AUTOPSIES.

AUTOPSY NO. 1.—DEATH MAY 24, 1902.—AUTOPSY JUNE 24, 1902.

	Direct Coverslip Preparations	Agar. Slants	Bouillon	Blood Serum
(Blood from ear collected before death.)	A few protozoa	Staph. Epid. Alb.	Staph. Epid. Alb.	Negative
Subcutaneous tissue	Fixative—Heat. Stain Eosin and Methylin Blue. Gram. Jenner. No Bacteria. A few protozoa	Negative	Negative	Negative
Pericordium	Heat. Eosin and Mtehylin Blue. Gram. Jenner. No Bacteria. A few protozoa	Negative	Negative	Negative
Heart Blood	Fixatives—Heat, Alcohol 96 per cent. Rouleaux present. Stains—Eosin and Methylin Blue. Gram. Jenner. Fodine. A few protozoa	Negative	Negative	Negative
Lungs	No Bacteria. A few protozoa	Negative	Negative	Negative
Spleen	Fixatives—Heat, Alcohol. Stains—Eosin and Methylin Blue. Gram. Jenner. Eodine. No Bacteria. Many Protozoa	Negative	Negative	Negative

AUTOPSY NO. 1—Continued.

	Direct Covership Preparations	Agar. Slants	Bouillon	Blood Serum
Spleen—Exterior sterilized and incubated 48 hours	Fixatives—Heat, Alcohol. Stains—Eosin and Methylin Blue. Gram. Jenner. No Bacteria. A few protozoa	Negative	Negative	Negative
Liver	Fixatives—Heat, Alcohol. Stains—Eosin and Methylin Blue. Gram. Jenner. No Bacteria. Many Protozoa	Negative	Negative	Negative
Intestines	Not made	B. Coli Commins and a large spore bearing bacillus	Same	Negative

AUTOPSY NO. 2—DIED 5 A. M., MAY 26, 1902. AUTOPSY MAY 26, 1 P. M. CULTURE INCUBATED AT 6 P. M. MAY 26, 1902.

	Direct Coverslip Preparations	Agar. Slants	Bouillon	Blood Serum
Blood from Finger (Before death.)	Rouleau. No Bacteria Poikilocytosis. Many Protozoa	Staphy. Pyo. Aureus Staphy. Epid. Albus	Staphy. Pyo. Aureus Staphy. Epid. Albus	Staphy. Pyo. Aureus Staphy. Epid. Albus
Brain	No Bacteria	Negative	Negative	Negative
Pericordium	No Bacteria	Negative	Negative	Negative
Heart Blood	Rouleau. Plokilocytosis. No Bacteria. Many Protozoa	Negative	Negative	Negative
Spleen	No Bacteria. Many Protozoa	Negative	Negative	Negative
Spleen—Sterilized and incubated 24 hours	A few Staphylococci	Staphy. Epid. Albus	Staph. Epid. Alb.	Staph. Epid. Alb.
Liver	No Bacteria. A few protozoa	Negative	Negative	Negative
Kidney	No Bacteria	Negative	Negative	Negative

Fixatures and stains as in No. 1.

AUTOPSY NO. 3.—DIED 1 P. M., JUNE 26, 1902. AUTOPSY, 11 P. M., JUNE 26, 1902. INCUBATED 11 A. M. JUNE 27, 1902.

	Direct Coverslip Preparations	Agar. Slants	Bouillon	Blood Serum
Subcutaness Tissue	No Bacteria	Negative	Negative	Negative
Brain	No Bacteria	Negative	Negative	Negative
Pericordium	No Bacteria	Mould	Negative	Negative
Heart Blood	Rouleau, Poikilocytosis, Blood plates. No Bacteria. Some Protozoa	Negative	Negative	Negative
Lungs	Not made	Negative	Negative	Negative
Spleen	No Bacteria. Iodophilia. Some Protozoa	Negative	Negative	Negative
Incubated Spleen	No Bacteria	Negative	Negative	Negative
Liver	No Bacteria. Many Protozoa	Negative	Negative	Negative
Kidneys	No Bacteria. A few protozoa	Negative	Negative	Negative

Fixatures and stains as in No. 1.

AUTOPSY NO. 4.—DEATH 11:30 A. M., JUNE 27, 1902. AUTOPSY 10 P. M., JUNE 27, 1902. CULTURES INCUBATED 5 P.M., JUNE 28, 1902.

	Direct Coverslip Preparations	Agar. Slants	Bouillon	Blood Serum
Pericordium	No Bacteria	Negative	Negative	Negative
Heart Blood	No Bacteria. Few Protozoa. Poikilocytosis	Negative	Negative	Negative
Lung	No Bacteria	Negative	Negative	Negative
Spleen	Bacilli (B. Coli. Com.) Protozoa	B. Coli. Com.	B. Coli. Com.	B. Coli. Com.
Incubated Spleen	Many Bacilli like those in direct Smears.	B. Coli. Com.	B. Coli. Com.	B. Coli. Com.
Liver	No Bacteria	Negative	Negative	Negative
Kidney	No Bacteria	Negative	Negative	Negative

Fixtures and stains as in No. 1.

AUTOPSY NO. 5.—DEATH MAY 28, 6 P. M. AUTOPSY MAY 29, 6 P. M., 1902. CULTURES INCUBATED MAY 30, NOON.

	Direct Coverslip Preparations	Agar. Slants	Bouillon	Blood Serum
Heart Blood	Bacilli—.5u x-5-7u. Stains by Gram. Bears spores. (Putrefactive?) Protozoa	Same Bacilli	Same Bacilli	Same Bacilli
Spleen	No Bacteria. Protozoa	Negative	Negative	Negative
Spleen Incubated	Bacilli. Protozoa, few	Bacilli	Bacilli	Bacilli
Liver				
Kidney, L.	No Bacteria	Negative	Negative	Negative
Kidney R.	No Bacteria	Negative	Negative	Negative

Fixatures and stains as In No. 1.

AUTOPSY NO. 6.—DEATH JUNE 4, 5:30 A. M. AUTOPSY JUNE 4, 8 A. M. CULTURES IN INCUBATOR, 10:30 A. M. JUNE 4, 1902.

	Direct Coverslip Preparations	Agar. Slants	Bouillon	Blood Serum
Heart Blood	No Bacteria. A few protozoa.............	Negative	Negative	Negative ....
Spleen	No Bacteria. Many protozoa	Negative	Negative	Negative ....
Liver	No Bacteria. Many protozoa	Negative	Negative	Negative ....
Kidneys	No Bacteria. A few protozoa	Negative	Negative	Negative ....

Fixatures and stains as in No. 1.
Blood used for inoculating habbit and pigeon.
Pulp used for inoculating rabbit and pigeon.

Protozoa.—A few ovoidal bodies were seen within red blood cells in stained direct coverslip preparations from cases 2, 3, 4, 5 and 6 early in the investigation. The character of these bodies was not determined, however, until microscopic examination of the fresh blood in case 7 was made. Similar examinations were made of the blood in cases 8, 9 and 10. In part of the examinations a warm stage was used, but in most of them it was not used, since it was found that if the blood were placed directly under the microscope and examined by artificial (lamp) light, in a warm room, the temperature was sufficiently high to preserve the organisms alive for several hours. In one instance they were successfully kept under observation in this manner for five and one-half hours. In all the examinations made of freshly-drawn blood (12 in all from 4 cases) in tracellular parasites showing amoeboid movements were found. In several of these observations extracellular forms were also found.

In the observations on freshly-drawn blood usually several fields were searched (with Zeiss obj. 1-12, Oc. 4) before any red cell was found containing a parasite. The same is true of stained coverslip preparations made from the blood of the living patient or at autopsy. Probably not more than one red cell in five hundred in the circulating blood is ordinarily infected. In one observation, however, made on the seventh day of illness in an adult male, (case 10), on fresh blood many red cells containing parasites were found. In this specimen fields contained from 125 to 175 red cells (estimated). Of these fields, two contained 11 infected red cells, each of which held one or two parasites. Another field contained 9 infected cells, another 7, and three contained 5 infected cells each. Nearly every field held one or more infected cells.*

Another similar observation on the fresh blood from the same patient, made forty-eight hours later, revealed only a very small number of the infected red cells. In the meantime no material change in the clinical symptoms had occurred.

In direct coverslip preparations, and in sections from the lung, heart muscle, spleen, liver and kidney great numbers of red blood cells were found which contained one or more parasites each. In the spleen, liver and kidney were many phagocytes, which had absorbed one to eight infected red blood cells each. (See Figs.

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*The counts in this examination were made after the specimen had been for 3 1-2 hours under observation at a temperature of about 33 C.

7, 8, 9. Plate II.) These were also present in preparations from other organs, though not in such large numbers.

The organism varies greatly in size, form and staining reaction at various stages of its development.

The smallest forms (phase 1) when seen in fresh (unstained) preparations or in freshly-dried preparations, unstained but mounted in iodinized gum-acacia, are intracellular, ovoidal in form, about one micron in thickness and one and one-half to two microns in length. They slightly resemble hyaline bodies in malaria, and very much so the micro-organism of Texas fever. A few, but certainly not nearly all, of these bodies are stained by Loffler's methylene blue. When so stained the smaller extremity takes up more of the stain than does the larger extremity, which remains but faintly blue, even after prolonged staining. (See Figs. 1 and 2. Plate II.) Perhaps one in ten of the red cells which are infected with this form of organism contains two instead of one of the bodies. When the organisms are in pairs within a cell, their long axes usually lie in the same straight line, though they may be placed at an angle as acute as 60 degrees. Their lesser extremities are often toward each other, though distinctly separated by a small interval. These bodies have occasionally been seen to change their position within the red cell, though the presence of pseudopodia or any other evidence of ameboid movement except the transference from place to place has not been observed in bodies of this size.

Several graduations in size, in both single and paired organisms, have occasionally been observed up to phase 2. This phase is marked by an organism solitary within the red cell, and usually ovoidal in form, though it may be elongated, ellipsoidal or spheroidal. It is from two to three microns thick and three to five microns long.

These forms have in a few instances been seen escaping from the red blood cells. (See Fig. 6. Plate II.)

Haematozoa of "Spotted Fever."

Specimens sketched with camera lucida, Zeiss Apochromatic obj. 1-5 mm., compensating ocular No. 8. (Magnification 1333 diameters. Specimens from which Figs. 1, 6 and 10 were fixed with alcohool, 96 per cent. and stained with eosin and methylene blue. The remaining sketches are from tissues fixed in Zenker's fluid and stained with eosin and methylene blue. Unnas method.)

Fig. 1. Phase 1, Organism in red blood cell from finger, Case II. (5th day of illness.)

Fig. 2. Phase 1, Organism in red blood cell from arm, Case III. (10th day of illness.)

Figs. 3 and 4. Phase 2, Organism in red blood cell from arm, Case III. (10th day of illness.)

Figs. 5 and 6. Phase 2, Organism in red blood cell from heart's blood, Case VII. (2 1-2 hours after death.)

Figs. 7 and 8. Phase 2, Organism in red blood cells which have been taken up by phagoeytes. From section of kidney, Case VII.

Fig. 9. Phase 2, Organisms in red blood cells which have been taken up by phagocytes. From section of liver, Case VII.

Fig. 10, Phase 3, Etracellular forms in blood from ear of case X.

Fig. 11. Unaffected red cells in sections from which Figs. 7, 8 and 9 were drawn.

Showing amoeboid movements of an organism in a red blood cell. Blood from ear of Case 10, 6th day of disease. Specimen examined in a room temperature of 80 degrees F. by lamp light with Zeiss oc. No. 4, Obj, 1-12. Four other r.b.c. in the same field contained parasites. The field contained in all about 175 r.b.c. The granule which was first seen at 9:06 P. M. was suddenly extruded from the parasite at 9:27 A. M. and had disappeared from the cell at 9:38 P. M. At 11:30 P. M. organism was still resting as at 10:58 P. M. These observations and sketches were made by Dr. F. F. Westbrook.

This type (Phase II) in freshly-drawn blood frequently exhibits active ameboid movements. These consist in the elongation of the organism, the projection of the pseudopodia in one or more directions, the final retraction of all pseudopodia and the assumption of the ovoidal form. One such organism was kept under observation for three and one-half hours. During the first hour and one-half the ameboid movements were very active, changes occurring more rapidly than they could be properly sketched. At the end of this time a reddish brown pigment (?) granule 0.5 microns in diameter was apparently extruded from the body of the organism into the protoplasm of the cell. After this the pseudopodia were all retracted, the

Plate II

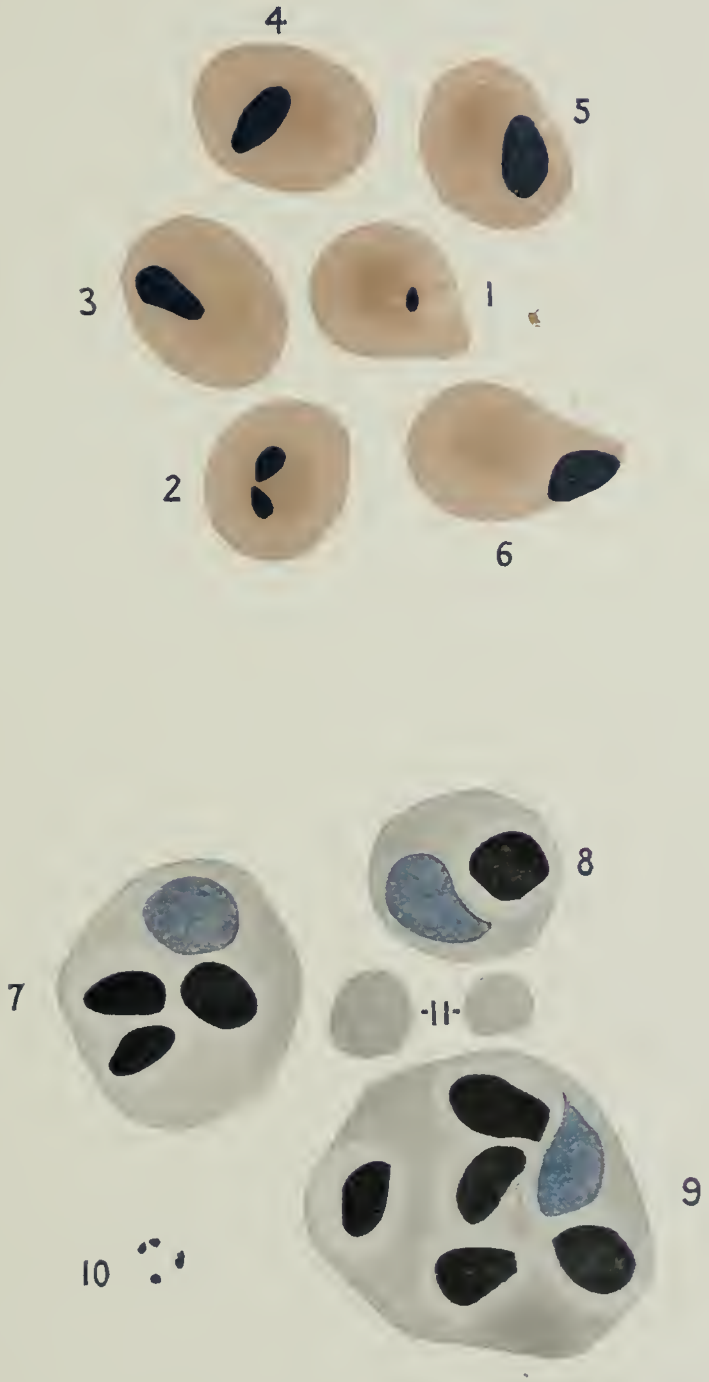
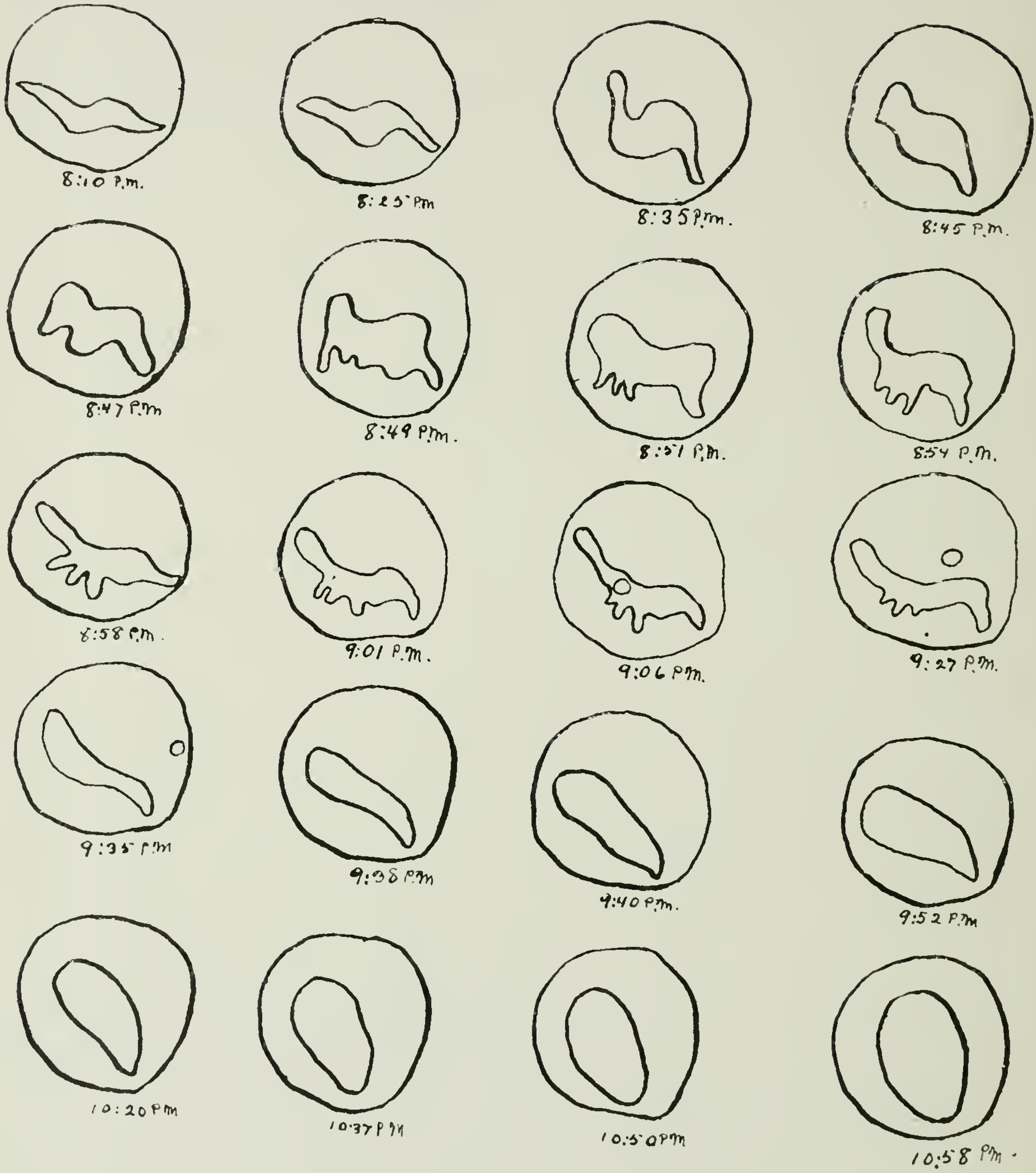


Plate III.



8:10 P.m. 8:25 Pm 8:35 P.m. 8:45 P.m.

8:47 P.m 8:49 P.m. 8:51 P.m. 8:54 P.m.

8:58 P.m. 9:01 P.m. 9:06 P.m. 9:27 P.m.

9:35 P.m 9:38 P.m 9:40 P.m. 9:52 P.m

10:20 PM 10:37 PM 10:50 PM 10:58 Pm.

organism which had previously been much elongated and curved slowly straightened out, became shorter and thicker, and finally came to rest, two hours and forty-five minutes after the beginning of the observation, as an ovoidal body about three microns in diameter at its thickest portion and five microns long. No further change occurred in the remaining forty-five minutes during which it was under observation. (See Plate III for sketch of movements above described.)

In the freshly-drawn blood are sometimes found bodies (phase 3?) occasionally in pairs, and then resembling diplococci, which are about 0.5 to 1 micron in diameter and exhibiting active Brownian movement. (See Fig. 10. Plate II.) In stained coverslip preparations from the blood of the living patient these bodies are occasionally seen. They vary much more in size than do cocci of one species, and sometimes, also, are ovoidal in shape. They stain but faintly with Loffler's methylene blue, and, indeed, in all respects resemble the smallest intracellular forms except that they are smaller, extracellular, less numerous and more diplococcus-like. In direct coverslip preparations made from the blood at autopsy no extracellular forms have as yet been found.

In marked contrast to the small number of infected cells in the circulating blood, is the great number of infected cells in the congested capillaries in the tissues removed at autopsy. Here from 1 to 5 per cent. of the red cells contain each a large parasite. (See Figs. 7, 8, 9. Plate II.) This is especially marked in the lung, spleen, liver and kidney. In these organs many red cells are also included in phagocytes, being faintly outlined within the protoplasm of the latter and each containing a large parasite. The ovoidal form, however, of most of the parasites appears to be lost shortly after death, since although many of this form are present in the tissues from autopsy No. 6 (made three hours after death), but very few are present in the tissues from autopsies No. 1 and 2, made seven and eight hours after death. In these tissues the organisms are almost all spheroidal. In the tissues removed at autopsy the parasites are metachromatic to methylene blue. Sections stained in eosin followed by Unna's or Loffer's alkaline methylene blue and then decolorized in water and alcohol until the nuclei of the cells are a very light shade of blue, show the parasites still stained an intense blue. The same general appearance is obtained by staining sections twenty-four hours in Nocht-Romanowsky's blood stain, then washing out in water and alcohol. These stains have given the most satisfactory results though the organisms may also be stained by fuchsin, hematoxylin, Jenner's blood stain ; etc.

So far no differentiation of the protoplasm in the large organisms seen in the tissues has been made out by any stain. In a very few instances, however, small, intracellular ovoidal types have been found after death, and these have stained lightly though more intensely than in fresh blood.

It will thus be seen that the organism, while it resembles in its smaller form very markedly the Pyrosoma bigeminum of Texas fever, yet differs from that organism in being larger, and in its larger forms exhibiting active ameboid movements with the projection of pseudo-podia. The absence of pigment from the organism of "spotted fever" would apparently separate it from the malarial group and place it with that of Texas fever. The writers, however, prefer to make a fuller study of the life history of the organism before attempting to classify it more definitely than as a hematozoan.

Inoculation Experiments.

About 0.5 c.c each of the spleen pulp and heart's blood removed at autopsy No. 6 was inoculated, four hours after the death of the patient, into the breast muscle of two pigeons and also subcutaneously in the right groin of two white rabbits. The blood of the pigeons was examined for several days thereafter, but the organisms were not found. The rabbits, on the day following inoculation, showed a rise of temperature of one degree C. At this time intracellular organisms were found in the blood of both rabbits, and continued present in specimens collected on successive days for two weeks. One of the animals was then killed. At autopsy the spleen was enlarged and darker than normal. It was not softened. There were no microscopic lesions in any other organ. The tissues were preserved in 95 per cent, alcohol, Zenker's fluid and 4 per cent. formaldehyd. Examination of these tissues shows many organisms indistinguishable morphologicaly from those found in tissues from human cases. The second rabbit is still alive, six months after the inoculation, and still shows the organisms present, though they are becoming less numerous.

Mode of Infection.

Since there is no suspicion of "spotted fever" ever having been transferred directly from man to man, and since there is no symptomatic or postmortem evidence of entrance of the disease either by way of the digestive tract, respiratory or genito-urinary systems, the writers were led to examine the skin for evidence of direct inoculation by the bite of some temporarily parasitic animal. As has been noted above, in each case under observation, during the investigation, evidence of tick bites was present. But it is true that in the locality in which the cases occur many persons in the spring of the year are bitten by ticks and yet show no symptoms of "spotted fever." However, the following facts would seem to suggest the hypothesis that the disease is conveyed to man by means of this arachnid:

1. Ticks are known to appear in the spring as soon as the snow melts from the sunny exposures; in other words, in the Bitter Root valley, as early as February 15. They are, however, chilled and inactive until the latter part of March or first of April. In relation to this, scattering cases of "spotted fever" appear during the latter part of March and first of April, and are most numerous during May and June.

2. Ticks become less numerous about the middle of June, and finally disappear about the middle of July. In connection with this it should be noted that cases of "spotted fever" become less and less numerous from the middle of June to the middle of July, after the 20th of which month no cases have been observed.

3. The occurrence of "spotted fever" in isolated cases in a region sharply limited on one side by a river, would indicate the conveyance of the germ to man (if by any animal whatsoever) by a temporarily parasitic animal which travels slowly and not widely, and which is not carried far by the wind, etc. The tick answers this description. Owing to the fact that the valley and foothills of the west side of the river is much more generally wooded than is the east side, ticks are apparently much more abundant on the west side than on the east side.

4. All hematozoa of warm-blooded animals, of which the life cycle is now known, pass, at least. one phase of their development within the body of some host (usually an insect or arachnid) other than the one whose blood cells they invade. This is probably also true of the hematozoan of "spotted fever."

5. The malarial organism, the hematozoan which in man most nearly resembles that of spotted fever, is conveyed to man by the bite of an insect. The organism of Texas fever, in cattle, which is apparently a very close relative of the germ causing spotted fever, is conveyed to cattle through the bite of ticks. It is perhaps unnecessary to note that of the many genera of mosquitoes only one carries the malarial organism to man, and of the many genera of ticks only one carries the Texas fever organism to cattle; further, that even in these specific genera by no means all of the individuals are affected with the pathogenic parasite.

6. There are at least three (probably more) species of ticks within the region in which spotted fever occurs, and the specific selection noted under No. 5 may apply to these.

7. All of the patients—ten—coming under observation during this investigation had been bitten by ticks. In three cases a history was given of a single severe tick bite two, three and five days, respectively, before the onset of the disease. In a number of other cases—but after the discussion of this hypothesis by local papers—an apparently clear history of severe tick bites immediately preceding the onset of "spotted fever" was vouched for by the (recovered) patients or their friends.

8. In the case of W. G., noted on page 4 1-2 a local infection with the presence of haematozoa morphologically indentical with those present in cases of "spotted fever" was certainly induced by the bite of a tick.

9. There is apparently no other insect, arachnid or other biting creature within the infected locality, which would fulfill the conditions indicated in the above outline as does the tick. For instance, it may be noted that the mosquitoes probably do not appear until a later date than that on which the earliest cases of "spotted fever" have developed, while they remain for several weeks after the spotted fever ceases. They move about freely and are readily carried by the wind. Were they the infective agents, one mosquito would probably infect two or more persons in the same family, and the disease would not be limited by the river. Bedbugs and fleas are present throughout the year and, from their persistent activity, would probably infect more than one individual in a family, were they the carriers of the disease.

A Gopher (Spermaphilus Columbians) Possibly the Normal Host of the Haematozoan.

The extreme isolation of cases of "spotted fever," their occasional development in localities removed many miles from the site of any previous case, and the long period existing between the death or convalescence of the last case of any one year before the development of the first case in the following year, renders improbable the transference of the haematozoa even indirectly—i.e. via an arachnid—from previous cases to new ones. The early recognition of this fact led the writers to consider the possibility of the red blood cells of some one of the lower warm-blooded animals being the normal habitat of the parasitic protozoon in that stage of its life cycle not passed within the body of some arachnid. The probability of any species of bird serving as such a host is rendered slight by the unique geographical distribution of the disease. Of the mammals of the locality the only one whose geographical and seasonal distribution bears any apparent relationship to the disease is the so-called "gray gopher" or "ground squirrel." This rodent is a spermophile—spermophilus columbianus—and a southern relative of Parry's Artic spermophile. The writers gathered blood smears and histological specimens from various animals in both uninfected and infected areas. Seven horses from an infected area from whom blood smear were stained and examined—but gave negative results—are not included in the following table, otherwise, all the animals examined were rodents and particularly the above mentioned gophers.

Materials were obtained mostly by shooting and taking the specimen at once. An attempt was made to determine the haemaglobin estimation in the field work by Tolquist's method, using ordinary blotting paper and comparing with a scale published in a medical journal. This, however, proved inaccurate, and live gophers were obtained by trapping for this and other purposes. Twenty-four of these live specimens were obtained. Some of these were studied in the laboratory at Missoula and others in the pathological laboratory at the University of Minnesota.

The following table shows the localities from which all specimens including grey gophers (Spermophilus Columbianus), pine squirrels (Sciurus Hudsonius—Var. Richardsoni), chipmunks (Tamius Asiaticus), and one young "snow shoe" rabbit from the east side of the Bitter Root river, were collected over an area beginning at the Hellgate River extending to a point about 8 miles south of Stevensville, a distance of about 40 miles and including the valley, from river bank to the upper foothills 10 miles east of the river, near the head waters of Burnt Fork Creek. (See map.) This area includes Sentinel Mountain, the base of which is within the city limits of Missoula; Ft. Missoula, Luby school district, and Higgin's ranch, the latter being on the head waters of Burnt Fork Creek.

TABLE 7.—SHOWING SPECIMENS COLLECTED AND LOCALITY FROM WHICH THEY CAME AND RESULTS OF EXAMINATION.

SPECIMENS FROM EAST SIDE OF BITTER ROOT RIVER.

LOCALITY	Gophers—Spermophilus Columplanus Specimens Taken on Field				Chipmunks—Tamius Asiaticus	Snowshoe Rabbit	Pine Squirrel	Living Gophers	Total	Results of Examination
	Old Females	Old Males	Young Females	Young Males						
Sentinel Mt.	4	3	1	1	1	......	......	1	11	None of these showed any parasite resembling that found in human case.
Ft. Missoula	2	....	....	....	....	......	......	......	2	
Luby near School House	1	3	1	1	....	......	......	......	6	
Other localities	3	4	6	6	....	......	......	......	19	

Uninfected Area.

SPECIMENS FROM NORTH SIDE OF HELLGATE RIVER.

LOCALITY	Old Females	Old Males	Young Females	Young Males	Chipmunks—Tamius Asiaticus	Snowshoe Rabbit	Pine Squirrel	Living Gophers	Total	Results of Examination
Grant Creek	1	1	3	6	....	......	......	......	11	
Total	.....	....	....	....	....	......	......	......	49	

Uninfected Area.

SPECIMENS FROM WEST SIDE OF BITTER ROOT RIVER.

LOCALITY	Old Females	Old Males	Young Females	Young Males	Chipmunks—Tamius Asiaticus	Snowshoe Rabbit	Pine Squirrel	Living Gophers	Total	Results of Examination
From Ft. Missoula Bridge to Lo Lo	2	1	1	5	1	......	......	......	10	About 22 per cent of all specimens examined show a parasite similar to that found in human cases. Of 5 gophers from Mt. Lo Lo examined, three were positive.
Mt. Lo Lo	1	....	1	1	4	1	2	10	20	
Hamilton	1	....	....	2	....	......	......	14	17	
Other localities	2	1	1	....	....	......	......	......	4	
Total	.....	....	....	....	....	......	......	......	51	

Infected Area.

2nd. From the north side of Hellgate in the neighborhood of Grant creek, all these form uninfected areas.

3d. The following from the infected districts as listed in Table 7 are interesting from the fact that they show in a large per cent of instances the presence of a parisite similar in form, size and staining qualities to that found in the human cases and in the rabbits inoculated with blood from Case 7. The first west side gopher examined was killed within 30 yards of the house where Case 9 was lying sick. The result of the examination was positive. A number of gophers, killed near Florence, in the vicinity of which a large part of all cases has occurred, were examined. These gave positive results. In nearly 30 per cent. the gophers marked on the Table 7 as coming from Hamilton, were killed or trapped on the clearing and within a few hundred yards of the house, where case No. 3 (our series No. 89, chart and map) was infected. Examination of blood from these was positive in about 1-3 of the specimens. The living gophers from Mt. Lo Lo showed the organism present in the blood in three out of five cases.

All living gophers were shipped from Missoula to Minneapolis and kept at the pathological laboratory of the University of Minnesota. Most of the work was done on them after Sept. 1st. The difficulty of getting proper specimens from them and the short time it was possible to give to the work before they went into hibernation, about Oct. 1st,* rendered the completion of this part of the work impossible.

The microscopic specimens were made from blood drawn from the hind foot after washing with water and alcohol. From the same source blood was obtained for haemoglobin extraction.

The blood smears were dried in the air and fixed in (a) blood oven, (b) alcohol 96 per cent, and (c) over 40 per cent Formalin.

The following staining methods were used: (a) Aqueous Eosin and Aqueous Methylin Blue, 1 per cent; (b) Jenner's method; (c) Wright's modification of Jenner's method; (d) Nocht-Romonowsky's; (e) Gram and Bismark Brown; (f) Craig's method.

The Haemogloobin estimations of gopher from both the infected and uninfected areas average between 90 and 100 per cent, and the red cell counts average 8,418,500, the counts ranging from 7,264,000 to 9,218,000.

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*Local observers generally agree that in the Bitter Root Valley the gophers begin hibernating about Aug. 15th. The specimens in captivity were kept in a warm room and tho they were sluggish a portion of the time during the month of Sept., they were readily awakened and did not go into permanent hibernation until about Oct. 1st.

As has been noted above, blood taken from West side gophers shows a haematazoan apparently identical with that found in the blood of "spotted fever" cases, and the blood of rabbits inoculated with blood from Case 7. Specimens from all others were negative as to this parasite.

It may be mentioned here that the writers have found in the blood of various gophers two other parasites, both outside the red cell: one, a long ovoid, from 20 to 30 micra in length and about 7 micra in thickness and non-motile. In stained specimens its protoplasm shows a decidedly granular composition The other, apparently a filiara, from 50 to 70 micra in length and about 7 micra in thickness at one extremity and tapering to a point at the other is very active in its movements—vigorously scattering the cells in the field.

The following is a brief summary of the facts which seem to be of importance in considering the possibility of Spermophilus Columbianus being a normal host of the haematozoan causing "spotted fever" in man.

1. The "grey gopher," spermaphilus columbianus, has but a limited distribution in the United States. This is in the northern Rocky Mountain region within which lies Western Montana.

2. It is very abundant on the west infected side of the Bitter Root valley. It is much less abundant on the east, uninfected, side. This was certainly true during the spring of 1902 as was evidenced by the few colonies discoverable on the east side. Residents of the district agree that this is usually the case.

3. In the Bitter Root valley the animal lives in rather sharply defined colonies and is probably not much of a wanderer from home except possibily at the rutting season.

4. While the animal is able to swim, it is averse to doing so. During the spring months the Bitter Root river is swollen with rains and melting snows until it becomes a wide and swift torrent. There are few bridges and it is difficult to conceive of any general passing back and forth to the two sides of the valley by the gopher.

5. Local accounts disagree as to the date when the gopher emerges from hibernation but it is probably about March 1st to 15th.

6. The gopher goes into hibernation during the month of August, probably about the middle.

7. Early in the spring the gopher is said to harbor great numbers of ticks. At the time the writers were making their investigation—June and July—a very few ticks were found attached to the gophers.

8. Nine of the 43 gophers from the west—infected—side of the valley whose blood and tissues were examined for haematozoa showed within their red blood cells haematozoa which in size, shape, staining reactions and movements (where fresh blood was examined) were indistinguishable from the haematozoa found in the blood of patients affected with "spotted fever."

9. Blood and tissues were examined from 48 gophers from the east—uninfected—side of the valley and from other nearby uninfected localities without the discovery as yet of any haematazoa similar to those found in gophers from the infected area. This negative evidence must of course be much more extensive before much weight can be attached to it.

10. That it is possible for one rodent—the rabbit—to carry within its red blood cells for a long time the haematozoa of "spotted fever" without the exhibition of any symptoms has been shown by the inoculation experiments noted on page (59 of Mss.). The gopher may be similarly unaffected, though infected with the parasites.

Points to Be Investigated.

The writers desire to call attention to the following points in connection with "spotted fever," which demand further study:

1. In future cases data concerning the presence or absence of tick bites must be obtained. The time between the bite and the onset of disease should be noted. **Ticks on the west side of the Bitter Root valley, which have actually bitten persons, should be carefully preserved and identified.**

2. Accurate records of temperature, pulse, respiration, blood cell counts and blood examination for haematozoa should be kept of future cases. In relation to these there should also be kept an accurate record of all medication, baths, etc. This is quite as important in the mild cases as in the severe ones.

3. Inoculation of various animals with blood from patients or with emulsions of various tissues collected at autopsies held soon after death should be made and results noted. Much work

must yet be done in order to determine the facts of the life history of the protozoan within the blood.

4. The material already at hand for the study of the morbid histology should be added to by other autopsies and the whole carefully studied.

5. While the tick-gopher hypothesis is a very alluring one, it must not be forgotten that as yet but few positive facts have been obtained for its establishment. Aside from the collection of clinical evidence attempts must be made to transfer haematozoa from infected gophers by direct blood inoculations and through tick bites to various uninfected animals as the rabbit. A comparison of the results of such inoculations, if successful, with similar inoculations from human cases (See No. 3) should give valuable data as to the identity or dissimilarity of the protozoa from gophers and those from man. In view of the high mortality of "spotted fever" it will probably be impossible to get any man to submit to a direct blood inoculation—or tick bite—from patients as has been done recently with yellow fever. But it seems probable that all that is necessary may be done by careful animal inoculation along the lines here indicated.

7. A careful biological study must be made of all the species of ticks—and possible also of other arachnids and insects—of the Bitter Root valley in order not only to determine the exact species, if any, concerned in carrying the infection, but also to discover if possible some facts of its life history which will aid in its extermination. This is also true of the gophers and perhaps must also extend to other rodents of the region.

LOUIS B. WILSON,
WM. M. CHOWNING.

University of Minnesota,
Dec. 31, 1902.

General Measures by the State Board of Health to Prevent Outbreaks of Smallpox.

1. Urge everybody by proclamation in the newspapers to be vaccinated.

2. Prevail upon contractors and all employers of labor, operating in your locality, to compel their employees to be vaccinated, upon penalty of dismissal.

3. See that all school boards carry out the desire of the State Board of Health, as to vaccination.

4. See that all chance for a spread of the disease from a former source of infection is prevented by fumigation, and the destruction of all contagion.

5. Have a quarantine hospital prepared where all infected shall be sent, and may be well cared for and comfortable.

6. Have a place of detention where suspected and exposed persons may be held, awaiting developments.

7. In all cases of suspects or reports of contagion, **act quickly.**

8. Trace out as speedily as possible, every person who has been exposed to the infection of smallpox. Make a note of the date of exposure.

When located vaccinate every person as soon as possible. Vaccinate also, all the members of such family or of the household in which he lives.

As to the question of quarantining a person who has been exposed to the smallpox.

If he is a transient, keep him under close quarantine. If he is a permanent resident and trustworthy, keep him under observation.

Persons who have been exposed to smallpox should be considered under two classes.

1. Those who have been exposed but once to the infection, and are immediately vaccinated. These should be kept under observation until there are unmistakable evidences of the success of the vaccination, when they can be discharged from further surveillance.

2. Persons who have been exposed to the smallpox and several days (over four) have elapsed before vaccination. These should be kept under observation fourteen days from their last possible exposure.

The wearing of their own infected clothing should be deemed a continuation of the exposure.

As soon as a person has been isolated on account of exposure to smallpox, give him a change of clothing, in warm weather (overalls and a blanket) may suffice, have him disinfect his hands, face and beard at least by washing in a 1:1000 solution of corrosive sublimate. Disinfect his clothing as soon as possible and have him put it on again.

Persons who are under quarantine or under observation on account of exposure to smallpox should be inspected by a physician at least once a day during the period of incubation.

Management of Outbreaks of Smallpox.

1. When smallpox or persons who have been exposed to smallpox comes to your town, **act quickly.**

2. When there are rumors of infectious persons or things, investigate at once.

As soon as a case of smallpox is discovered send them immediately to a quarantine hospital.

3. Secure the names of all exposed persons, induce them to be vaccinated, and keep them in detention for fourteen days, or until their vaccination has proven successful. In the vaccination of exposed persons, "Time is money," and delay sometimes costs the county much money, and prompt vaccination is required for all exposed persons, that they may get ahead of the smallpox and modify or prevent it entirely, and the speediest possible "take" is desirable.

The vaccination should be repeated time and time again until a "take" results, or you are thoroughly satisfied that the persons are fully protected.

4. Thoroughly fumigate all infected apartments, as per "Instructions on Fumigating."

5. Comply with the law that requires that you send immediate notice to the Secretary of the State Board of Health of this outbreak.

Suspects or exposed persons should be detained and inspected by a physician at least once a day, until the time of incubation has passed, which is usually fourteen days from the last exposure. The wearing of their own infected clothing should be deemed a continuance of the exposure, therefore as soon as isolated give them a change of clothing, and have them disinfected by bathing in 1:1000 solution of corrosive sublimate, and washing the hands, beard and face in same, and then put on disinfected clothing. The powers of the local Board of Health are ample in almost any contingency.

The duty of the board is to act promptly, the whole matter is in their hands and no time should be wasted in running around to get the approval or consent of the municipal authorities or any one else. Your town or county will be obliged to pay all reasonable and honest bills, and the more prompt you act the smaller the bills will be.

If any person breaks quarantine, violates the provisions of the health laws, or interferes with the work of the board, so as to prevent the execution of the provisions of the law, have him arrested at once.

If infectious, he can be held in any kind of a place until he can be disinfected and brought before a justice for trial.

Smallpox has been more or less prevalent in this State ever since the summer of 1899, and owing to this mild type of the disease, many cases are allowed to wander about unobserved, or not subjected to very strict quarantine, thus perpetuating the disease.

Several counties of the State have expended large sums of money in the endeavor to stamp out this epidemic, with more or less success, but owing to the wandering cases the work has been greatly impeded.

All cases of rashes or pimples should be carefully investigated and if found to be smallpox immediately quarantined, though exceedingly mild.

The matter has been carefully investigated by the most capable experts in the country who have pronounced it genuine smallpox though the mildest type of the disease ever known, which is no special guarantee that severe cases or a severe epidemic may not arise from the present mild one.

The most frequent mistake in the diagnosis is with chickenpox as the chickenpox almost never attacks adults, therefore any adults affected with a rash of papular, macular or vesicular type, treat with great suspicion until you can make an absolute diagnosis.

It has also been called by various names as the "Cuban Itch," "The Japanese Measles," but competent men who have carefully investigated the matter say there are no such diseases.

Every case of eruptive disease should be reported to the health authorities as soon as it is discovered, and immediately investigated by them, as a few hours of procrastination or doubt is often responsible for a great deal of trouble to many.

Before compulsory vaccination was introduced in Germany that country lost 143,000 lives annually, from the smallpox, whereas since all must be vaccinated she now loses but 116, and these cases appear in towns along the border, where the law is not strictly enforced.

It appears almost impossible now that the disease has gained such a foothold in the State to eradicate it, and present a clean Bill of Health. It is very desirous to induce the population to avail themselves of vaccination, as that is the surest and most effectual of all known means.

While the disease may still appear in the vaccinated, it is of much milder type and the vaccinated are very much less susceptible to contract the contagion.

The State Board of Health expects that all children who wish to attend school shall have been successfully vaccinated within the last five years.

Smallpox has prevailed more or less generally throughout the State for the past three years, in an exceedingly mild form, although it has been the cause of several deaths. The first cases that we have any knowledge of were in Cascade County in the summer of 1899, some of them being held in quarantine, and others being seen by physicians, who persisted in calling the ailment chickenpox, and refusing to have the same quarantined, thereby exposing many, until in September it became quite prevalent, and from the fact that several of the physicians of Great Falls presisted in making the diagnosis of smallpox, and quarantining such cases, it created such a sensation that the city council of Great Falls upon the advice of the county health officer, determined to have a conference of five physicians visit all cases in question and make their report to said council, which was to the effect that the then five cases existing were smallpox, in a mild and modified form.

This brought about a conference between the city council and the County Board of Health of Cascade County, which resulted in the creation of a joint committee consisting of members from each body, to investigate, with power to act. They in turn were easily persuaded by the health officer and others that they were confronting a very serious condition, and prompt and efficient action was necessary. Accordingly they set about and equipped a smallpox hospital, to receive and maintain all patients who became afflicted with the trouble within the limits of Cascade County. Great damage had already been done by some of the first few cases being allowed to wander around unrestricted, such exposure resulting in an epidemic, which burdened the county with one hundred and seven cases in the next three or four months. By that time the smallpox had become more or less prevalent throughout the State, and there being no State Board of Health the Governor was petitioned to create the same, that the work of prevention and quarantine might be carried on with a greater degree of uniformity and thoroughness. As even after the existence of several hundred cases in different parts of the State, the laity, borne out by the opinion of several of the physicians, that the disease was not smallpox, but some obscure and inoffensive trouble, either chickenpox or "Cuban Itch" that had been transported from the Philippine Islands, and was not entitled to any great consideration. However, the Governor having no authority to create a State Board of Health that would have any powers whatever, a bill was prepared and presented to and passed by the Seventh Legislative Assembly, which met in January, 1901, creating a State Board of Health. Prior to this time all regulations for the restriction of smallpox were carried out by individual counties in which the disease prevailed with a varied degree of rigidity.

Another source of great danger of infection is through wandering bands of Cree and Chippewa Indians who go from place to place with no restraint from fraternal government, as they are mostly Canadian Indians, or are not subjects of the United States. They have in many instances, been the cause of transmitting smallpox, and when it was found that smallpox existed in their midst they have been a great burden to the counties in which they were quarantined. The native Indians upon the reservation within the State are well provided for and thoroughly guarded while infected. Wherever infection has occurred on the reservation it would appear from reports at hand that it is almost invariably brought to them by wandering bands of Indians and half breeds allowed to visit the reservation. Although the outbreak which occurred in 1901 in Flathead County would appear to be due to the ejectment of half breeds and Cree Indians having no rights upon the reservation, and were ordered off, some of them having been exposed and others recovering from smallpox at the time. The large amount of railroad construction and repairs that has been carried on in the State for the past two or three years, necessitating large campe of men gathered from all sources, has been another fruitful cause of infection and spread of the disease. However, the individual counties in which these camps have been located have been diligent in their endeavors to minimize the dangers from that source.

SMALLPOX, 1901.

COUNTIES	No. Cases	No. Vaccinated	No. Unvaccinated	AVERAGE AGES, YEARS						Total
				1 to 10	10 to 20	20 to 30	30 to 40	Over 40	Not Stated	
Park	8	1	7	....	....	....	....	....	......	......
Yellowstone	6	2	4	....	....	....	....	....	......	......
Missoula	1	1	....	....	....	....	....	....	......	......
Madison	2	....	....	....	....	....	....	....	......	......
Silver Bow	8	1	7	....	....	....	....	....	......	......
Ravalli	10	....	10	....	....	....	....	....	......	......
Cascade	2	....	2	....	....	....	....	....	......	......

SMALLPOX, 1902.

COUNTIES	No. Cases	No. Vaccinated	No. Unvaccinated	AVERAGE AGES, YEARS						Total
				1 to 10	10 to 20	20 to 30	30 to 40	Over 40	Not Stated	
Broadwater	....	*	*	....	....	....	....	....	......	80
Beaverhead	80	*	*	8	8	40	10	4	10	......
Cascade	14	*	*	....	....	....	....	....	......	14
Choteau	20	*	*	3	6	11	....	....	......	20
Carbon	73	*	*	2	....	71	....	....	......	71
Custer	....	....	....	....	....	....	....	....	......	......
Deer Lodge	....	....	....	....	....	....	....	....	......	......
Dawson	....	....	....	....	....	....	....	....	......	......
Flathead	171	*	*	....	....	....	....	....	......	171
Fergus	52	*	*	2	18	6	24	2	......	52
Gallatin	27	*	*	....	....	....	....	....	......	27
Granite	....	....	....	....	....	....	....	....	......	......
Jefferson	....	....	....	....	....	....	....	....	......	......
Lewis and Clarke	20	7	13	....	2	9	6	3	......	20
Missoula	....	....	....	....	....	....	....	....	......	......
Madison	16	*	*	....	....	....	....	....	......	16
Meagher	5	....	5	....	....	....	5	....	......	5
Park	....	....	....	....	....	....	....	....	......	......
Powell	....	....	....	....	....	....	....	....	......	......
Ravalli	180	*	*	50	25	40	17	9	39	180
Silver Bow	85	13	72	....	....	....	....	....	......	85
Sweet Grass	29	3	26	4	10	6	9	....	......	29
Teton	9	2	7	....	....	....	....	....	......	9
Valley	....	....	....	....	....	....	....	....	......	......
Yellowstone	48	6	42	....	....	....	....	....	......	48

* Not stated.

It will be observed that a vast majority of the cases having smallpox have never been vaccinated. Realizing that vaccination is one of the greatest possible aids of stamping out an epidemic of smallpox, it was considered advisable by the Board to issue the following circular letter to the school trustees throughout the State:

OFFICE OF THE STATE BOARD OF HEALTH.

Great Falls, June 20th, 1901.

Circular letter to School Trustees.

Dear Sir:—Owing to the great prevalence of smallpox throughout the State, and fully aware of the great protective benefit attained by vaccination, the State Board of Health of Montana therefore, in order to protect the general public, and particularly maintain our public schools, find it necessary to adopt the following resolution:

"In consideration of the general prevalence of smallpox throughout the State, it is deemed advisable to notify all school boards and to require all school children to be vaccinated, or show evidence of successful vaccination within the past five years, before attending any public, private or parochial school."

Therefore we call upon all school trustees and teachers to see that the above instructions are carried out.

Montana State Board of Health.
A. F. LONGEWAY, M. D.,
Secretary.

This letter caused a little opposition in some localities, but was agreeably received in most, and the suggestion of having all school children vaccinated prior to attending school has been adopted in several of the more important centers of education where it has been carried on for one or more years. I am advised by the Health Officers of those localities that fully 95 per cent of the children of school age have been successfully vaccinated. I think this is a very important point in the absence of a law providing for compulsory vaccination. It has been held that where smallpox already exists or there is imminent danger of an outbreak or epidemic, it is within the province of a local Board of Health or a Board of School Trustees, upon the advice of the local health officer to the effect that there is such danger, to demand for the protection of the general public and the maintenance of the schools, that all children attending such schools shall be provided with a certificate of successful vaccination within a reasonable length of time. If these provisions can be carried out, we will soon have a well vaccinated community and be much better equipped to combat with an epidemic of smallpox that may confront us in the future.

The following suggestions upon vaccination were offered:

In the early part of this year I induced the County Board of Health of Cascade County to establish a free vaccination, and appoint all practitioners, desirious of becoming free vaccinators that it might maintain harmony and in no way interfere with the private work, providing they would agree to keep the records which were to be audited by the local Board, and receive the sum of 25 cents per patient vaccinated. The county to supply all the necessary vaccine. This worked admirably, as it did away with the objection of poverty or inability to pay for being vaccinated, and many availed themselves of the opportunity, thus accomplishing the desire of having a well vaccinated community, and throwing no great burden upon the county. The small amount of money required to carry on this system is well spent inasmuch as it aids to stamp out the existing epidemic, and creates a good feeling in the community.

The expenditure is probably returned many fold in the avoidance of many exposures and cases in the un-vaccinated which would have to be maintained at a great expense by the county.

I laid the plan of free vaccination, as outlined in the following letter, before the commissioners of the various counties throughout the State, and find some approved of the arrangements and instituted free vaccination with a great deal of satisfaction.

Great Falls, January 9, 1902.

Dear Doctor:—A system of free vaccination for the county has been established by the County Board of Health, making every licensed practitioner who cares to adopt it, a free vaccinator, with the understanding that the county is to supply all the necessary vaccine, and he is to receive from the county the sum of 25 cents for each vaccination, as per the reports made to the county, upon the blanks furnished, audited and found correct by the Board of Health. If you care to accept this proposition kindly sign the within enclosure, also the application for the number of points you think you will use during the month, and they will be sent you upon receipt of such application.

A. F. LONGEWAY, M. D.

Diphtheria.

Diphtheria is a dangerous, contagious disease, very fatal to children under five years of age, and prevails to a greater or less extent in this State at times, and adults are not infrequently affected, but usually have it in mild form.

The disease is caused by a germ, which lodges in the throat or upper air passages and grows, forming a whitish membrane, and a poison is created which is absorbed, and produces the symptoms of the disease.

Membranous Croup in nearly all, if not all cases, is **Diphtheria,** the membrane being limited to the upper part of the windpipe. Membranous or Diphtheritic Croup is contagious, like other forms of Diphtheria, and the same precautions are required for its prevention.

Diphtheria and Membranous Croup (and in speaking of them hereafter both will be included under Diphtheria) are spread by means of this germ. The secretions from the nose, throat and mouth of a person having the disease contain this germ in abundance, and the air of the sick room is usually infected with it. Everything in the sick room should be regarded as infected.

The germ may live outside of the body, in clothing, rags, on toys, etc., for a long time, possibly years, and may thus be carried any distance. It may also be carried by dogs and cats admitted to the sick room.

The germs are usually present in the secretions from the nose or throat for some days, (possibly two or three weeks) after the patient appears to be entirely well, and the throat free from membrane.

Filth does not cause diphtheria, but persons living amid filthy surroundings, in dark, damp, badly ventilated houses, are more apt to contract the disease, and usually have it in a more malignant form than those better situated. The germ is also perpetuated in filthy places.

Special Management of Cases.

When diphtheria is present in a community every child with a sore throat and fever should be regarded with suspicion. If at school such child should be sent home at once, with a note to the parents requesting them to have the child examined by a physician. These suspected cases should be isolated at once and kept apart from other children until a physician pronounces that the disease is not diphtheria.

As soon as the child is known to have diphtheria it is advisable to take it to a room prepared by removing everything not needed for the patient or his attendants. It should be kept in mind that everything in the room must be finally disinfected, so the less in it the better. The room should of course be prepared before the child is taken into it.

If there are other children in the house they may escape the disease by the proper precautions.

The room in which the patient is isolated should be upstairs preferably, and as remote from living rooms as possible. A sheet kept wet with a disinfectant and hung over the door of the sick room will protect other parts of the house against infection.

The mother or nurse should not mingle with other members of the family, if avoidable, and if not, should wear a washable garment completely protecting the body, with a cap for the hair, to be removed when leaving the sick room.

The hands of the nurse should be thoroughly washed in the disinfectant solution each time the patient or any thing which has been about the patient is handled.

The remains of food or drink which has been in the sick room should be burned or disinfected. The nurse, if possible, should avoid eating or drinking in the sick room.

The patients should be kept isolated for two weeks after the throat symptoms have disappeared, for reasons previously stated.

If death occurs, the body as soon as possible, should be wrapped in a sheet wet with the disinfectant, and should not be again exposed to view. The law requires its burial within twenty-four hours after its death, except by written permission of the Board of Health. The funeral must be strictly private and no child allowed to attend.

The Prevention of Diphtheria.

Attention should first be given to the sanitary condition of the house. Cleanliness with sunlight and fresh air, in abundance may be had in the humblest home; and more than anything else are the means of securing good health. Fifth of all kinds about the house and yards should be removed, rather than to attempt to disinfect it.

But healthy children in healthy homes may contract diphtheria and when the disease appears in a community, parents should take every precaution to keep their children away from possible sources of contagion, and should themselves avoid going near the disease. Adults, as stated, usually have the disease in a mild form, and may have the disease without knowing or being aware of it, but during the prevalence of diphtheria adults having a sore throat should avoid children until a physician has pronounced their disease not to be diphtheria.

When diphtheria makes its appearance in a community, the safety of the public depends upon the promptness and strictness with which the local health officer enforces quarantine measures. By quarantine the isolation of the persons sick with the disease, and those intimately associated with them. Parents should therefore give the Board of Health, and the health officer all possible assistance and support in properly enforcing preventive measures.

The laws of Montana require the attending physician to report every case of diphtheria immediately, after becoming aware of the nature of the disease.

The health officer is required to give public notice of the disease by a placard, and no one is permitted to enter or leave the premises excepting the physician and necessary attendants, without the written permission of the health officer or Board of Health.

When the patient has recovered, or after death, it is the health officer's duty to see that disinfection is properly carried out.

If these measures were promptly and strictly enforced, in all cases, diptheria to a very large extent would be prevented, and the lives of many children, which are needlessly sacrificed each year would be saved.

In the absence of any specific appropriation made by the Legislature for bacteriological work, the Board saw fit at its meeting to appoint Mr. Emil Starz, State Bacteriologist, and that with the meager funds at their hands taken from the expense account of the workings of the Board, they in order to facilitate and aid the physicians throughout the State in the diagnosis and care of diphtheria, to establish a laboratory and supply shipping tubes to be distributed at the various depositories throughout the State, where any practicing physician could obtain the same, make his throat cultures, and send to the State Bacteriologist and get a bacteriological report with the greatest dispatch, to the physician or patient in all or any cases of suspicious throats or suspected diphtheria. This was done in order to establish a nucleus for a bacteriological laboratory, under the auspices and workings of the State Board of Health, as soon as the Legislature in its wisdom saw fit to make some appropriation for the same.

It is extremely essential that these aids should be rendered the practitioners throughout the State to carry on this work with the greatest benefit to the whole people. All well equipped Boards of Health in other states find that their bacteriological department is equally as essential as any other department under their charge. We are sincerely in hopes, as time advances, to not be obliged to confine this free examination to diphtheria, as it is at present, owing to lack of funds, but to be able to carry on the work in its entirety, which will include the diagnosis of tuberculosis, typhoid fever, etc., with sputum examinations and water analysis for all public purposes, and this should be free to communities or municipalities, or at a minimum cost, as the absolute correct diagnosis of the first or obscure cases frequently avoids a serious epidemic with great cost and loss of life. In presenting you this first report of our State Bacteriologist we feel that we have done something in the right line, though our efforts have of necessity been confined to narrow lmits.

DIPHTHERIA 1902.

COUNTIES	Population	January	February	March	April	May	June	July	August	September	October	November	December	Total
Broadwater	2,641	6	8	..	..	..	....	....	2	2	....	....	....	18
Beaverhead	5.615	..	..	..	..	..	....	....	....	....	....	....	....	....
Cascade	25,777	..	..	3	2	7	2	....	3	1	1	....	....	19
Choteau	10,966	..	3	..	..	..	....	....	4	....	....	....	....	7
Carbon	7,533	..	..	..	..	..	....	....	....	....	....	....	....	....
Custer	7,891	..	..	..	..	..	....	....	....	....	....	....	....	....
Deer Lodge	17,393	..	..	..	..	..	....	....	....	....	....	....	....	....
Dawson	2,443	..	..	..	..	..	....	....	....	....	....	....	....	....
Flathead	9,375	..	..	..	..	..	3	....	....	....	....	....	....	3
Fergus	6,937	..	..	..	..	..	....	....	....	....	....	....	....	....
Gallatin	9,553	..	..	..	..	..	1	3	....	....	....	....	....	4
Granite	4,328	..	..	..	..	..	....	....	....	....	....	....	....	....
Jefferson	5,330	..	..	..	..	..	....	....	....	....	....	....	....	....
Lewis and Clarke	19,171	..	..	1	..	..	1	3	....	....	3	....	....	8
Missoula	13,964	..	..	..	..	..	....	7	5	....	....	....	....	12
Madison	7,695	..	..	..	..	..	....	....	....	....	....	....	....	....
Meagher	2,526	..	..	..	..	..	....	....	....	....	....	....	....	....
Park	7,341	..	..	..	..	..	2	....	....	....	....	....	....	2
Powell	......	..	..	..	..	..	....	....	....	....	....	....	....	....
Ravalli	7,822	..	..	..	..	..	....	....	....	....	....	....	....	....
Silver Bow	47,635	..	..	..	..	1	....	2	1	....	....	....	....	4
Sweet Grass	3,086	..	..	..	..	..	....	....	....	....	....	....	....	....
Teton	5,080	..	..	..	..	..	....	....	....	....	....	....	....	....
Valley	4,353	3	2	..	..	..	....	....	....	....	....	....	....	5
Yellowstone	6,212	..	..	..	..	..	....	....	....	1	2	....	....	3
Total	......	..	..	..	..	..	....	....	....	....	....	....	....	85

Special effort has been made in the way of diagnosis and care of diphtheria, both because of the highly infectious nature and the usual high mortality accompanying these epidemics, particularly prior to the administration of anti-toxine. This Board has established a bacteriological department for the free examination of all secretions of suspected diphtheritic throats, and have supplied shipping tubes as described in order No. 176 of the United States Postal Laws, and distributed the same in depositories in drug stores in the more important centers throughout the State, that they may be always within easy reach of the physician requiring them. They are thoroughly sterilized and ready for use; all that is required is to remove the plug, apply the swab contained therein to the suspected throat, replace in the tube and mail immediately to Mr. Emil Starz, State Bacteriologist, who will give them prompt attention and report his findings to the sender with the greatest possible dispatch.

A letter of instructions and notification of the various depositories where these shipping tubes can be obtained will be sent to all physicians in the State; the following is a list of depositories. Many more will be established as soon as suitable arrangements can be made.

East Helena—Richardson's Drug Store, 5 tubes.
Havre—Broadwater's Drug Store, 6 tubes.
Philipsburg—Drug Store, 4 tubes.
Red Lodge—Drug Store, 5 tubes.
Dillon—Central Drug Store, 6 tubes.
Billings—Chappel Drug Store Co., 12 tubes.
Livingston—Scheuber Drug Co., 6 tubes.
Anaconda—Smith Drug Co., 10 tubes.
Deer Lodge—Whitworth Pharmacy, 6 tubes.
Townsend—Dunbar's Pharmacy, 5.
Butte—Finlin Drug Co., 12 tubes.
Great Falls—Randall Drug Co., 12 tubes.
Bozeman—Lee Warren Pharmacy, 12 tubes.
Fort Benton—D. L. Lockwood Drug Store, 3 tubes.
Boulder—Drug Store, 6 tubes.
Missoula—S. Coffee's Drug Store, 20 tubes.
Butte—Parson, Rockfeller Drug Store, 14 tubes.
Centerville, Butte—Doull Bros. Drug Store, 6 tubes.
Kalispell—Drug Store, 6 tubes.

The following is a report of some of the work done by this department for the first six months of its existence, showing the relative importance of a diagnosis.

Some of these cases were well marked and others only suspected and the report clears up any doubt.

May 1, 1902.

A. F. LONGEWAY, M. D.
Secretary Montana State Board of Health,
Great Falls, Montana.

Dear Sir:—I beg to hand you herewith a statement of the work done by me as Bacteriologist to your Board from November 15, 1901 to May 1, 1902.

Aside from some miscellaneous microscopical examinations most of the work performed pertained to the diagnosis of the bacillus Diphtheria Loffler in cultures taken from suspected throat affections. While a number of physicians have taken advantage of the offer of the Montana State Board of Health in the matter of their offer to make bacteriological examinations free of charge for physicians in cases of suspected diphtheria, yet it seems, the majority are either not cognizant of it or, otherwise, do not think it worth while to go to the trouble. From the accompanying report of my work you will observe that it is chiefly the physicians in or around Helena who have taken advantage of the free bacteriological tests. This is evidently due to the fact that too much time is consumed to make it practicable for physicians living at a distance to avail themselves of the offer of the Board. However, in several cases the bacteriological examination has been shown to be of the utmost value and a number of physicians have expressed their enthusiastic appreciation ot the work done in my department. In my opinion there can be no doubt as to the wisdom of the Board in providing a free bacteriological test station and its patronage is destined to increase.

Very respectfully,

EMIL STARZ.

Report of Culture Tubes Examined by Emil Starz, Bacteriologist to the Montana State Board of Health.

(1). Nov. 22, 1901. Forwarded by Dr. Walker, Winston., Mont., two tubes. Bacillus Diphtheria Loffler found in both tubes.

(2). Nov. 27, 1901. Forwarded by Dr. Walker, Winston, Mont., two tubes. No Bacillus Diphtheria Loffler found in either.

(3). Dec. 29. 1901. Forwarded by Dr. M. Dean, Helena. Mont., one tube. No Bacillus Diphtheria Loffler found.

(4). Jan. 4, 1902. Forwarded by Dr. J. A. Walker, Winston, Mont., two tubes. Found Bacillus Diphtheria Loffler in both.

(5). Jan. 19, 1902. Forwarded by Dr. J. A. Walker, Winston, Mont., two tubes. No Bacillus Diphtheria Loffler found in either.

(6). Jan. 20, 1902. Forwarded by Dr. J. A. Walker, Winston, Mont., one tube. Bacillus Diphtheria Loffler found.

(7). Jan. 21. 1902. Forwarded by Dr. Belcher, Townsend, one tube. Bacillus Diphtheria Loffler found.

(8). Feb. 14, 1902. Forwarded by Dr. J. A. Walker, Winston, one tube. Diphtheria Bacillus found.

(9). March 2, 1902. Forwarded by Dr. N. Salvail, Helena, one tube. No Bacillus Diphtheria Loffler found.

(10). March 17, 1902. Forwarded by Dr. Holden, Helena, two tubes. No Diphtheria Bacillus found.

(11). March 19, 1902. Forwarded by Dr. Holden, Helena, one tube. No diphtheria Bacillus found.

(12). March 20, 1902. Forwarded by Dr. W. C. Riddell, Helena, one tube. Diphtheria Bacillus found.

(13). March 21, 1902. Forwarded by Dr. M. Dean, Helena, two tubes. No Diphtheria Bacillus found.

(14). March 26, 1902. Forwarded by Dr. M. Dean, Helena, two tubes. Bacillus Diphtheria found in both.

(15). April 6, 1902. Forwarded by Dr. Longeway, Great Falls, one tube. No Diphtheria Bacillus found.

(16). April 16, 1902. Forwarded by Dr. Riddell, Helena, one tube. Bacillus Diphtheria Loffler found.

(17). April 23, 1902. Forwarded by Dr. M. Dean, Helena, one tube. No Bacillus Diphtheria found.

(18). April 25, 1902. Forwarded by Dr. Dean, Helena, one tube. Found Bacillus Diphtheria.

Respectfully submitted,
EMIL STARZ,
Bacteriologist.

This department is becoming much more popular as it becomes known to the physicians. No provision has been made heretofore whereby they could get this work done with any degree of promptness.

The State Bacteriological Department is always ready to make examinations of sputum or typhoid, or water analysis, and it is forced to make a nominal charge for the same, inasmuch as the State has not funds at the present time to carry on this work with a free laboratory.

REPORT OF THE BACTERIOLOGIST.

A. F. LONGEWAY, M. D.,
Secretary, Montana State Board of Health,
Great Falls, Montana.

Dear Sir:—It is gratifying to be able to state that physicians have availed themselves of the provisions of the law which privileges them to consult this department free of charge whenever in the course of their practice they encounter a suspected diphtheritic infection.

Since my connection with your Honorable Board as Bacteriologist, I have examined thirty samples of suspected cases of diphtheria, of which fourteen showed the presence of bacillus diphtheria Loeffler.

Besides the diagnostic examination of suspected diphtheria membranes, several samples of sputa from suspected tuberculosis patients have been examined, and also several samples of blood (Widal test) from suspected typhoid fever patients.

While it is true that very distant places with scanty train service, or no trains at all, are practically deprived of the benefits of this department by reason of the length of time it requires for transmittal of the tubes and the consequent delay in reporting results, yet, I would have it known to the profession that it is the intention to make the law operative and its provisions accessible in the highest practicable degree; therefore, upon application, sterilized tubes with swabs will be forwarded to any one desiring them.

In the future this department will endeavor to facilitate matters by establishing depots at drug stores in the more prominent towns of the state, wherefrom physicians may at any time obtain sterilized throat swabs to take specimens from suspected diphtheria cases and forward these to the Bacteriologist's laboratory for diagnosis. It is intended to establish depots at the following towns: Anaconda, Billings, Butte, Boulder, Bozeman, Deer Lodge, Dillon, East Helena, Fort Benton, Great Falls, Havre, Helena, Kalispell, Livingston, Missoula, Philipsburg, Red

Lodge and Townsend. These depots will always be supplied with fresh tubes containing swabs ready for immediate use by the physicians.

The present form of the outfits adopted by the State Board of Health consists of a heavy mailing tube containing a tin tube with a test tube and an aluminum throat swab. Directions accompany the outfit. These tubes are thoroughly sterilized before they are delivered to the respective depots for the use of physicians. As soon as a swab is inoculated it should be replaced in the test tube by the physician and the entire outfit forwarded at once to this department for examination. A report of the results will be promptly mailed. The development of the culture and the microscopical examination requires from eight to twelve hours.

Upon receipt of the inoculated throat swabs blood serum tubes are inoculated by gently rubbing the swabs against the surface of the serum. The inoculated serum is at once placed in an incubator and left there at a constant temperature of 37.5 degrees Celsius until a perceptible growth is observable. Cases of true diphtheria develop as a rule sooner than those of so-called pseudo-diphtheria. A retarded growth of a culture is, usually, more apt to show, upon microscopical examination, absence of bacillus diphtheria Loeffler. Microscopic preparations from cultures are made by spreading evenly a very small amount of the culture mixed with a droplet of sterilized distilled water upon a glass slide, drying it over a flame and staining with a 1-1000 aqueous Sodium hydrate (alkaline) solution of methylviolet or methylenblue after which the slide is rinsed in water to remove surplus stain, dried and examined with 1-12 oil immersion lens.

The Department recognizes as essential characteristics of the bacillus diphtheria Loeffler the following:

1. A rapid developing culture, producing large numbers of bacilli of the same kind.

2. Bacilli from four to seven times greater breadth than length; not regular in outline; many pointed at the ends; others pointed at one end and club shaped at the other; individual cells which do not stain evenly but show irregular areas where the protoplasm has not absorbed the stain, the stain being more pronounced at the enlarged ends.

3. The arrangement of the bacilli as scattered individuals,

and side by side closely together. They do not occur in chains but are often arranged end to end in twos.

In false diphtheria various forms of staphylococcus, streptococcus and pneumonia bacteria are observed.

I have endeavored to cover as much ground in my work as possible in spite of the adverse conditions under which I have labored, and have discharged every duty imposed upon me to the best of my ability. I hope that the future holds more propitious conditions in store for this Department and that more liberal appropriations will be made in order that I may extend the usefulness of the work beyond mere bacteriological and microscopical examinations for diphtheria bacilli, on into the field of investigation for tuberculosis, typhoid fever and other infectious and contagious diseases as well as to the examination of milk, food products and drinking water.

Respectfully submitted,

EMIL STARZ,

Bacteriologist.

The prevalence of scarlet fever throughout the State for the past year may be accounted for by the mildness of the attack and the objection people have to maintain strict quarantine for an extended period, which is absolutely necessary even in mild cases, to stamp out the disease and avoid recurrent cases. The infection is most tenacious and probably most dangerous during the period of desquamation which lasts from one to three or four weeks, even in some cases longer. So that in many mild cases where there is no doctor within call, and the report has not reached the health officer, thereby avoiding quarantine and extending the disease.

I also find a great variance in the period of quarantine with the different local health officers; we have suggested a minimum of four weeks with a longer time in severe cases, which has not been universally adopted on account of the complaints of the patients being isolated, after the child is apparently well, not taking into consideration that some fine scales of desquamation are falling, and they can not understand why such apparent hardships be devolved upon them, thus working on the sympathies of the tender-hearted health officer and neighbors and persuading them that it is a matter of persecution rather than protection.

I do not believe this menace will ever be overcome until such time as all such cases are put directly under the supervision of a quarantine officer, whose sole duty it is to visit and inspect such infected cases, and he alone, be held absolutely responsible for the period of quarantine and disinfection; when it is left in the hands of the attending physician to say when the period of desquamation has been completed and the disinfection carried out, it is often times neglected and some times very difficult to prevail on the attendant that his greater duty is toward the protection of the public regardless of the feeling of his patient, and many times I fear that he is biased in his opinion and we cannot overlook the fact that his livelihood and income is derived from the individual patient and not from the public. Much good has been accomplished by public conventions of health officers and those interested in preventative medicine and public sanitation, and I believe that if the present plan of this Board in calling a State Sanitary Convention to be made up of delegates and sanitarians from every community within the State, to discuss the relative importance of quarantine, disinfection and all matters of sanitation, that untold good may be expected and accomplished by the interchange of ideas and the probable arrival of uniform rules to be practised throughout the State on these points.

The following suggestions have been offered by way of prevention and care of scarlet fever:

Scarlet Fever.

Scarlet fever is one of the most protracted contagious diseases. A person who has had the disease may recover in a few days, but will remain capable of communicating it to others for a period of from six to eight weeks. All scarlet fever infected houses should be placarded for at least six weeks, and no person from such infected house should be permitted to return to school for a period of at least eight weeks, and not less than two weeks after the fumigation of the house, if the disease has been protracted beyond six weeks. Mild forms of scarlet fever are sometimes called scarlet rash, scarlatina, or canker rash, but they are all the same disease, equally contagious, and the mildest in one person, capable of causing the most severe type in others. Carelessness in parents, nurses and others occupying positions of responsibility, does more to spread scarlet fever than any or all other causes. The early return of scarlet fever patients to school and the careless mingling with well persons of other occupants of the infected house, are frequent media of contagion.

This disease always decreases in prevalence and fatality during vacation and promptly begins to increase within a month after the re-opening of the school.

The contagion or poison of scarlet fever surpasses that of any other eruptive disease except smallpox, in its tenacious attachment to objects and its portability to distant localities.

The poison may retain its infecting properties for months unless destroyed by proper disinfection.

It usually attacks children under ten years of age, hence the great importance of preventing children from being exposed to the disease. Scarlet fever never originates from any telluric or atmospheric influence, but is always due to a specific principle or contagium; in other words, scarlet fever can only occur by infection from a pre-existing case of the same disease.

It is believed by the strict observance of the rules and regulations of quarantine and disinfection this disease may be greatly restricted or entirely stamped out.

When a child has a sore throat and fever, and especially when scarlet fever is prevalent in the neighborhood it should be at once separated from the others until a physician has seen it and determined whether it has scarlet fever.

When a person is known to be sick with this disease no matter how light the attack may be he should be immediately separated from the others, excepting the necessary attendants and removed to a room specially prepared for its occupancy.

This room should be prepared by removing from it all superfluous furniture, carpets, extra clothing, etc., in short, everything not absolutely needed for the comfort of the sick, or the convenience of the attendants. Closets connecting with the sick room should have all clothing removed from them.

The room should be large, preferably in the upper story, and as far removed from the family room as possible.

The sick room can be still further separated from other parts of the house by hanging a sheet kept constantly wet with a disinfectant solution over the door of the exit.

The best means for disinfecting a sick room is to secure an abundance of fresh air. The patient, however must not be exposed to direct drafts, and this can be avoided by fitting beneath the lower window sash a strip of board a few inches in width.

Other children of the family not affected may be sent to some place where there are no children or others liable to take the disease, but their clothing should not have been in the room with the patient, or should be disinfected, and they should remain apart from the public for ten days.

No person should be permitted to visit the family unless absolutely necessary, and no one should be admitted to the sick room except the nurse and necessary attendants.

A card with "**Scarlet Fever**" should be placed in a conspicuous place on the house or premises in which there is a person sick with the disease.

The attendants should wear only such clothing as can be washed, and should not come in contact with other members of the family, especially children, without first changing clothing and disinfecting the person.

All cups, glasses, spoons, etc., used in the sick room should be washed separate from the other dishes, and should remain some time in boiling water.

Towels, bed clothes, the patient's body linen, etc., should not be mixed with the other soiled clothing, or be admitted to the general wash without first being thoroughly disinfected.

All persons recovering from scarlet fever are dangerous. They are sources of contagion so long as any peeling or scaling of the skin continues, and must be kept secluded until this process is fully completed.

The quarantine rules of the State Board of Health require isolation of the patient and quarantine of children associated with, or in the house with the patient for ten days after complete desquamation or scaling of patient and disinfection of the premises.

A public funeral must not be held of any one dying from this disease, and in no case should any child be permitted to attend. Newspaper notices of such deaths should distinctly state that the deceased died of scarlet fever.

SCARLET FEVER.

COUNTIES	Population...	January.....	February....	March ...	April....	May........	June........	July... ...	August......	September ...	October......	November....	December...	Total ....
Broadwater	2,641	..	..	1	21	..	....	....	....	9	....	....	....	31
Beaverhead	5,615	..	..	..	13	7	....	....	....	9	....	....	....	29
Cascade	25,777	10	11	10	3	4	15	2	4	3	....	....	....	62
Choteau	10,966	..	1	..	..	..	....	....	....	....	....	....	....	1
Carbon	7,533	..	..	4	1	..	1	....	....	....	....	....	....	6
Custer	7,891	..	..	..	1	..	....	....	....	....	....	....	....	1
Deer Lodge	17,393	..	..	..	..	..	....	....	....	....	....	....	....	....
Dawson	2,443	..	..	..	..	..	....	....	....	....	....	....	....	....
Flathead	9,375	..	..	..	..	..	4	3	1	....	....	....	....	8
Fergus	6,937	..	..	..	..	..	....	....	....	....	....	....	....	....
Gallatin	9,553	..	1	..	..	4	....	1	....	....	....	....	....	6
Granite	4,328	..	..	..	..	..	2	....	....	....	....	....	....	2
Jefferson	5,330	..	..	..	..	..	....	....	....	....	....	....	....	....
Lewis and Clarke	19,171	..	..	18	22	11	8	....	....	2	12	....	....	73
Missoula	13 934	..	..	..	..	..	....	....	....	....	....	....	....	....
Madison	7,695	..	..	..	..	..	....	....	....	....	....	....	....	....
Meagher	2 526	..	..	..	..	..	....	....	....	....	....	....	....	....
Park	7,341	..	..	7	7	1	21	....	....	....	....	....	....	36
Powell	......	..	..	..	..	..	....	....	....	....	....	....	....	....
Ravalli	7,82	..	..	..	..	..	....	....	....	....	....	....	....	....
Silver Bow	47,635	10	13	3	3	8	13	5	3	....	1	....	....	59
Sweet Grass	3,086	..	..	..	..	..	....	....	....	....	....	....	....	....
Teton	5,08	..	2	..	..	3	1	....	....	....	....	....	....	6
Valley	4,353	..	..	..	..	..	....	....	....	....	....	....	....	....
Yellowstone	6,21	..	..	17	7	..	....	....	....	....	....	....	....	24
Total	......	..	..	..	..	..	....	....	....	....	....	....	....	344

Measles.

Measles have probably been very much more prevalent than the accompanying report would indicate, but few of the counties apparently deeming it necessary to report these cases at all.

The following suggestions have been offered for the care and prevention of an epidemic:

Measles are less dangerous to life than many other infectious diseases, but it is nevertheless sometimes fatal, and consequently should be carefully guarded against.

Children from infected houses should be kept at home for at least a week after the child who has been ill has recovered, and the patient should not be allowed to return to school until after complete recovery from the cough, inflammation of the eyes, nose and throat and the teacher should at once send a child home for medical examination, who has cough, running eyes, eruption on the face, or other suspicious symptoms.

General preventive measures in the school room and elsewhere are of as much importance as definite action in specific cases.

Inquiry should be made in all cases of absence from school as to the cause, and if sickness of the child or sickness of the family is given as the reason, satisfactory evidence should be required that such sickness is not of a contagious nature.

Books supplied to families where there has been a contagious disease, should be collected and destroyed, as it is almost impossible to properly disinfect books.

Rotheln or German Measles require the same precautionary measures as Measles.

MEASLES, 1902.

COUNTIES	Population	January	February	March	April	May	June	July	August	September	October	November	December	Total
Broadwater	2,641	..	..	..	..	..	....	....	....	....	....	....	....	....
Beaverhead	5,615	..	..	..	..	..	....	....	....	....	....	....	....	....
Cascade	25,777	..	15	22	4	20	50	25	....	....	....	....	....	135
Choteau	10,966	..	..	..	..	..	....	5	....	....	....	....	....	5
Carbon	7,533	..	..	..	..	..	....	....	....	....	....	....	....	....
Custer	7,891	..	..	..	..	..	....	....	....	....	....	....	....	....
Deer Lodge	17,393	..	..	..	..	..	....	....	....	....	....	....	....	....
Dawson	2,443	..	..	..	..	..	....	....	....	....	....	....	....	....
Flathead	9,375	..	..	..	..	..	....	....	....	....	....	....	....	....
Fergus	6,937	..	..	..	..	..	....	....	....	....	....	....	....	....
Gallatin	9,553	..	..	..	..	..	....	....	....	....	....	....	....	....
Granite	4,328	..	..	..	..	..	....	....	....	....	....	....	....	....
Jefferson	5,330	..	..	..	..	..	....	....	....	....	....	....	....	....
Lewis and Clarke	19,171	..	2	5	..	..	2	....	....	....	....	....	....	9
Missoula	13,964	..	..	..	..	..	....	....	....	....	....	....	....	....
Madison	7,695	..	..	..	..	..	....	....	....	....	....	....	....	....
Meagher	2,526	..	..	..	..	..	....	....	....	....	....	....	....	....
Park	7,341	..	..	..	..	..	....	....	....	....	....	....	....	....
Powell	......	..	..	..	..	..	....	....	....	....	....	....	....	....
Ravalli	7,822	..	..	2	..	..	....	....	....	....	....	....	....	2
Silver Bow	47,635	..	3	..	..	..	....	....	....	....	....	....	....	3
Sweet Grass	3,086	..	..	..	..	..	....	....	....	....	....	....	....	....
Teton	5,080	..	1	..	..	..	....	....	....	....	....	....	....	1
Valley	4,353	..	..	..	..	..	....	....	....	....	....	....	....	....
Yellowstone	6,212	..	..	4	..	..	....	....	....	....	....	....	....	4
Total	......	..	..	..	..	..	....	....	....	....	....	....	....	160

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